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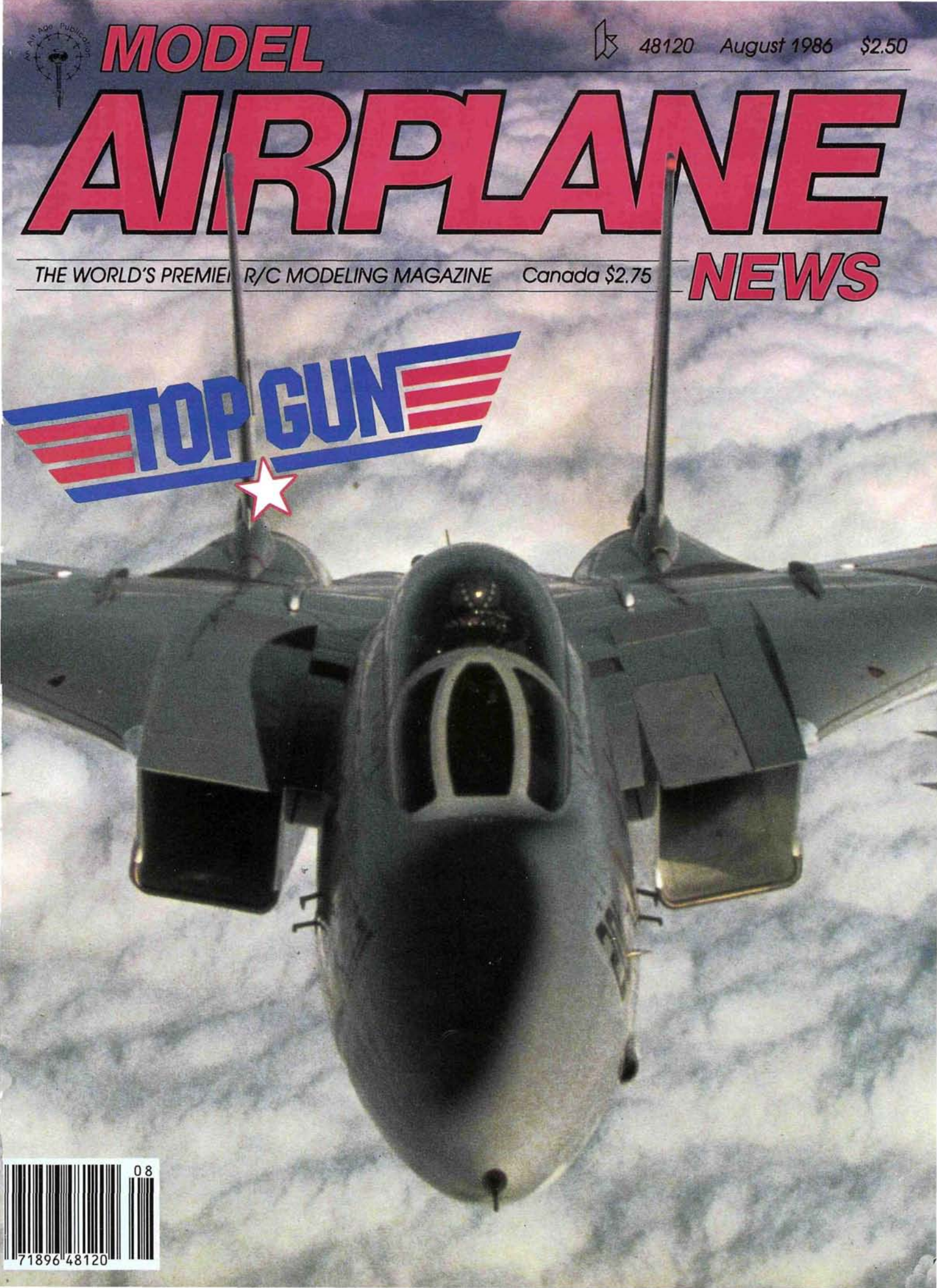

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AUGUST 1986 VOLUME 113, NUMBER 2

MODEL AIRPLANE NEWS

ON THE COVER: "Draw, Partner!" That's what the pilot of this Tomcat seems to wish. The F-14 is a lethal weapon and is the backbone of our Armed Forces interceptor capability. It's featured in the movie "Top Gun," a Paramount release and one of this year's hottest films. It's bound to become a classic. Build your own Tomcat from our plan #6821. Photo courtesy of Grumman.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

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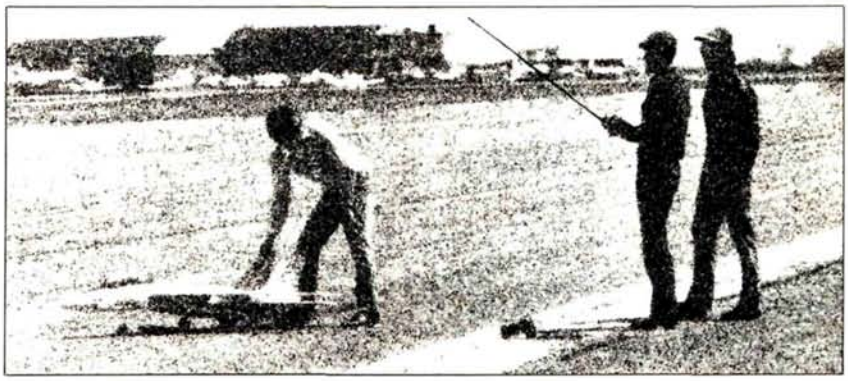
Editorial

by DAN SANTICH

WE HAVE A PROBLEM in this hobby that, if not corrected soon, could spell the end of modeling as we know it. That problem is noise. With public reprisal as it is concerning environmental issues, we modelers with our screaming airplanes are becoming more and more the target of criticism and admonishment from flying fields around the world. Not a month goes by that I don't read about a club that's in trouble over noise. To the neighbors living close to our fields, we are nothing more than a source of aggravation. And we are inflicting permanent damage to our own hearing ability. A pneumatic drill at 5 feet, according to the National Institute for Occupational Safety and Health, measures 116 decibels and can cause permanent hearing loss. Yet, we allow our models to operate far in excess of that. The maximum sound level permitted under FAI regulations is 100 decibels at 3½ feet, *which is the same as a police siren!*



Are we the victims or the perpetrators? Both. By accepting the noise that our models make as "part of the game," we are just as guilty as the noisemaker. What we have to do is draw the line and say "enough is enough." We have to establish an acceptable noise level, which by most accounts is below 50 decibels at 3½ feet, write this into the AMA rule book, and, above all, enforce it. This means that the engines we have today won't be legal to run unless some astonishing muffler development takes place real soon. It also means that the engine makers will have to get on the ball and develop an engine that runs quietly. If performance suffers some, that's the price. But it sure seems like a small one when you think of the alternative—not flying at all!

Necessity is the mother of invention, and we sure have the need. We have a lot of talented people in this hobby, and I'm sure that if we pool our efforts we can come up with a workable solution. Write to me, or better yet, to the engine makers. Tell them that their engines are too noisy; offer solutions. Try to help them and they in turn will help you. That is what this hobby is all about.

THIS MONTH. The movie "Top Gun" has hit the silver screen and this is one action-packed film. We hope you enjoy our "preview," as well as the photographs. Modelers will love the movie, especially since much of the special effects were done with R/C models. A dynamite sport model graces this issue for the scratch builder, the Acrostreak. And, if you've had a problem with your two-stroke engine, you may find the solution in my troubleshooting article. We hope you enjoy this issue.

DBS

Airwaves

Bob Palmer Fan

I am one of those modelers who is finally getting back to the hobby after leaving in the late '50s. Although I am amazed and happy with the advances in construction techniques and radio equipment, I am delighted with your articles about how things were "back then."

I am writing about a photo of Bob Palmer on page 56 of your June 1986 issue. He was one of my heroes while I was in high school and I would like to know if he is still around. I recall seeing plans in *M.A.N.* for a Palmer design called the Pow-Wow and it looked much like the plane in your photo. Has my memory slipped over the last 30 years or is this the same plane?

JIM HOLMES
Lexington, Kentucky

The plane Bob Palmer is holding in the photograph is his Thunderbird design which was kitted by Veco. Bob won the California State Championship with it in 1953. I saw him fly his Smoothie at the California Championships in 1952 and he was also one of my idols. The last I heard he was living in California and was making fiberglass fuselages. I was always amazed at the beautiful work he did, especially considering the fact that he had only one hand. It's good to have you back!

DBS

Fuel Tank Basics

You did an excellent job of writing an informative article in the July 1986 issue of *Model Airplane News* about fuel tank systems, and thank you for mentioning some of our products.

We would like to pass on a few corrections concerning our tanks. All of our tank bodies are blow molded, both our standard version and our flextanks. We design all of our tanks to withstand any amount of screw tightening; unless there is a manufacturing defect, you should be able to tighten the stopper screw to the point of stripping the hole in the inside washer without damaging the tank itself. Our tanks must be blow molded to have this kind of strength, and you will see the words "Sullivan Seamless" on every one of our tanks bodies. To our knowledge, not a single Sullivan Seamless tank has split over the three years they have been in production.

JAMES R. HUDSON
Vice President, Sullivan Products
Baltimore, Maryland

More "Pro & Con"

I've just finished reading your "Airwaves" column in the June '86 issue. I must comment on the letters by Art Schmitz and Bruce Abell.

I agree with Mr. Schmitz; twelve issues a year aren't enough and Budd Davisson's articles are super. What better way to find out how your scale model will fly than to read about the full-scale version.

Mr. Abell, however, I feel is out of order. I purchase every magazine Budd Davisson writes for. He sometimes makes reference to modeling while writing for the full-size magazines. What a great way to improve our image with the public! Thanks Budd!

ROY VAILLANCOURT
Farmingville, New York

Editorial

From the Publisher

Airplanes, cars...and now boats!

AS I WRITE this editorial, *Model Airplane News* is celebrating its 57th anniversary. In a time when the attrition rate of magazines is ever increasing, 57 years is nothing short of an incredible feat. But does this mean we will be resting on our laurels? Quite the contrary. We will strive even harder with each issue to bring you the most informative and entertaining R/C airplane magazine in the world. Sales are way up and 99% of all reader correspondence we receive is quite complimentary. We want to give you what you want, so keep the letters and comments flying in!

We are the innovators and we will place no constraints on our ingenuity and creativity. As the hobby grows and evolves, so will we. We have many more publications planned and we can report that our newest magazine, *Radio Control Car Action,* is a tremendous success. The circulation is now over 100,000 and the publication will be nearing 130 pages! Radio control cars are the best thing that has ever happened to R/C modeling. It has virtually taken R/C right out of the closet and into public visibility. And remember, because R/C cars teach the newcomer the fundamentals of radio control modeling, each car modeler is a potential R/C airplane modeler!

With this anniversary I would like to tell you of yet another magazine we will be introducing this fall. It's called *American Boat Modeler* and it will be exclusively for the R/C model boat enthusiast. Model boaters have always been treated like second-rate stepsisters, foraging through model airplane magazines and shoddy newsletters trying to extract crumbs of less-than-adequate information. There are, however, a substantial amount of boat modelers, but since they have been without one unifying national magazine, they have gotten minimal exposure. No more. *American Boat Modeler* will be informative, colorful, and entertaining, and will cover the whole gamut of R/C model boating. The pilot issue will be available in October, so spread the word! By the way, this means even more great airplane information for you in *Model Airplane News*!

Louis V. De Francesco Jr.

SERVOS

Basics of Radio Control

by RANDY RANDOLPH

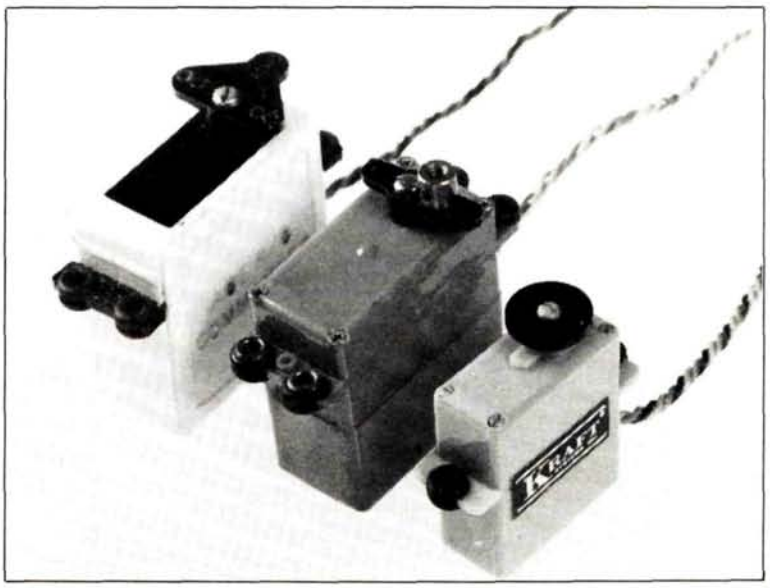
FOR THE LAST FEW months I've discussed some of the things that pertain to the building of R/C airplanes. This month I'll look at what puts the "control" in "radio-control"—the servos.

The term "servo" is short for "servo-mechanism," which is an "electronic system in which a controlling mechanism is actuated by a low-energy signal." Therefore, the servo is the controlling mechanism in the R/C system. The receiver hears the signal from the transmitter and tells the servo how to move.

Each aircraft surface, or function, must have a separate servo to direct its movement. Each servo requires a separate signal, or channel, for its proper operation. If the receiver is the heart of the system, the servo is the muscle. A "full-house" system would have four servos controlling the elevator, rudder, ailerons, and engine throttle.

Internally, each servo in the airplane is the same and operates in the same manner. Part of the receiver's job is to sort through the received signals and inform each servo separately how to act. Since all servos are the same, where they are plugged into the receiver dictates which function they will fulfill.

Although there are slight variations from manufacturer to manufacturer, each servo will contain a small circuit board, a small electric motor, and a variable resistor (like the volume control on your stereo) which is connected through a gear train to the motor *and* the output arm.

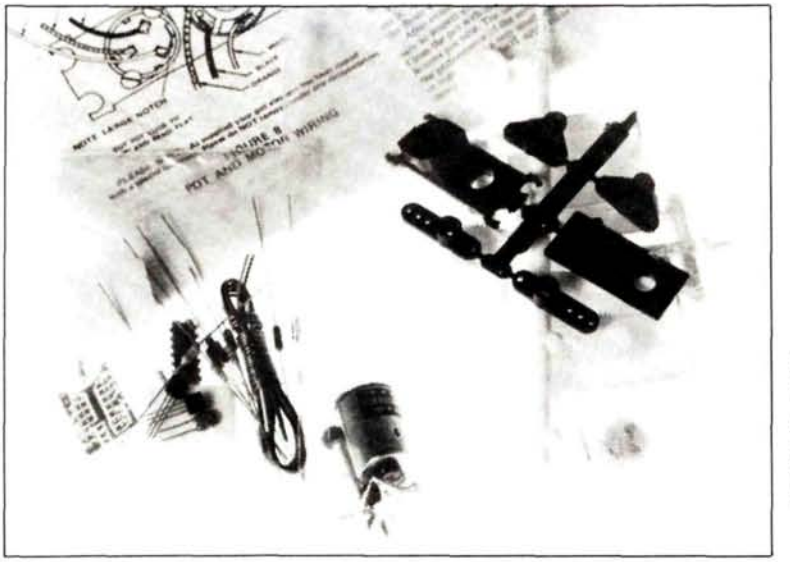


Three sizes of servos show the differences in output arms. Each one is different since there is no servo standardization in the R/C industry.

In very simplified terms, when the servo receives a signal, it causes unbalance in the circuit, and the motor starts to run (the direction depending on the unbalance) and continues to run until the movement of the variable resistor through the gear chain brings the circuit back into balance. Since the output arm is attached to the same shaft as the variable resistor, it follows this movement. A small unbalance causes a small movement and a large unbalance causes a large movement, hence proportional control of the output arm is dependent on the amount of movement sent to the servo from the stick on the transmitter.

Now that you have some idea of how servos work, let's see how to connect them into the control system of the airplane.

As a rule, the output arm of most servos provides a circular movement of about 90° or so, which is 45° in each direction. Therefore, you can always depend on a push or pull movement



Assembling a servo from a kit, such as the Ace R/C, is not only relatively inexpensive, but a good way to familiarize yourself with its parts.

from the arm as long as you stay in the same plane as the arm. The servos can be mounted in the airplane parallel to the fuselage, across it, upside down, or right side up and still give the same movement. This is quite handy because in most installations the servos are mounted just that way, lengthwise, crosswise, and upside down!

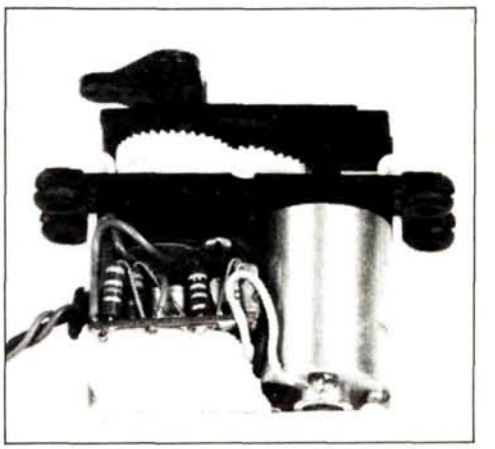
Consider two four-channel airplanes; a low-wing and a high-wing. In the high-wing airplane the throttle, the elevator, and the rudder servos are mounted in the fuselage cabin area and are upright in respect to the airplane. The aileron servo is mounted at the center of the wing and is upside down. If it were right side up, it would have to be on the outside of the airplane to work properly! Conversely, in the low-wing airplane the throttle, elevator, and rudder servos are upside down and the aileron servo in the wing is right side up. Often the throttle servo is mounted across the fuselage to provide a little more room in the cabin area ahead of the servos.

Servos are best mounted in a plastic or wooden tray, which is then mounted in the airplane. The rubber grommets in the mounting holes of the servos are there to help keep vibration to a minimum. For this reason the screws holding the servos to the tray should be tightened just enough to hold the servos securely without crushing the grommets.

The servos in their tray are one of the heavier components of the radio system. It's considered good practice to slide the tray and servos forward or back on mounting rails along each side of the fuselage to achieve proper balance for the airplane. You do this, of course, after the batteries and receiver are in place. When the proper location is found, the tray can be secured and the pushrods to the elevator, rudder, and throttle can be connected to the proper servos.

The servo that controls the ailerons is mounted at the wing center section. The usual strip aileron installation uses both sides of the servo output arm, two pushrods, and two control horns, one for each aileron, to give the required opposite movements to these surfaces.

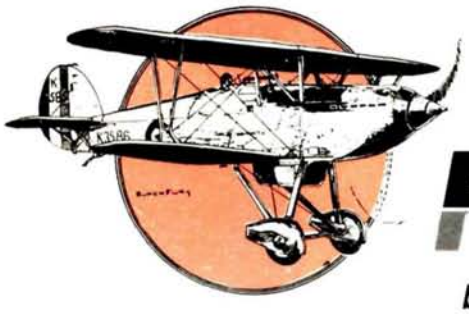
Servos are subject to a lot of abuse in the course of a flying season, especially those that control the rudder and a tailwheel or nosewheel at the same time, so check them carefully before each flight. They should move quickly to the transmitter command and shouldn't have any dead spots along their travel. A servo that jitters or seems to "hunt" usually can be corrected by having a service technician clean the gear train and the variable resistor or "pot."



This is the inside of a typical servo, showing gears, motor, and electronics.

The servos are the horses of the radio system—keep them well groomed!

Randy Randolph, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■



Fifty Years Ago...

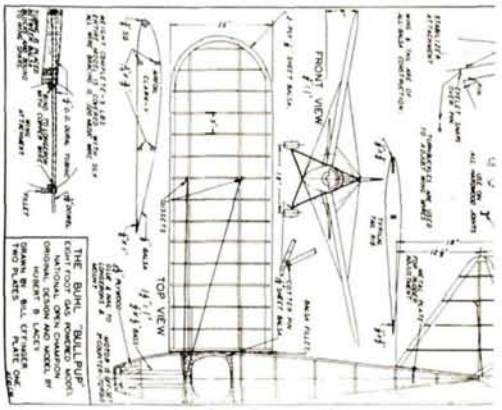
by DAN SANTICH

GASOLINE motors and gas-powered models were, by August 1936, the rage of the hobby. Nothing before or since has had such an impact or influence on the growth of model airplane activities. At first the only gas engine available was the Brown Junior, but in the span of one year ten new engines appeared on the scene. Propellers for gas engines, up to that time, were hand-made. Berkeley Model Supplies of Brooklyn, New York, saw the need and produced laminated spruce and mahogany props in several different sizes. Berkeley also offered some great new kits for these engines, the Buccaneer and Cavalier among them. Modelcraft of Los Angeles introduced the Scout, a "hot" design with a 54-inch span to carry the new Cyclone engine. Scientific Model Airplane Company of Newark, New Jersey, reported being "swamped" with orders for their 7-foot span Miss America kit, which sold complete for only $7.50!

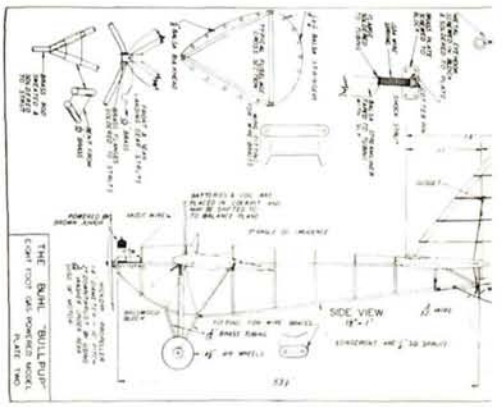
Berkeley Models was among the first to provide carved wooden props for gas engines.

A pair of Ohlsson wheels really dressed up your model in 1936.

Accessories were also coming into being for the gas models. Ohlsson Miniatures of Los Angeles introduced streamlined wheels in several sizes and a company called Modelplane Specialty Company offered a building jig called the Modelplane Assembly Fixture. Jap tissue and dope comprised the primary method of covering. Since the glowplug had yet to be introduced, all engines were of spark ignition type and used regular gasoline for fuel, with an oil mix.



The second gas design featured in M.A.N. was Lacey's Bullpup.



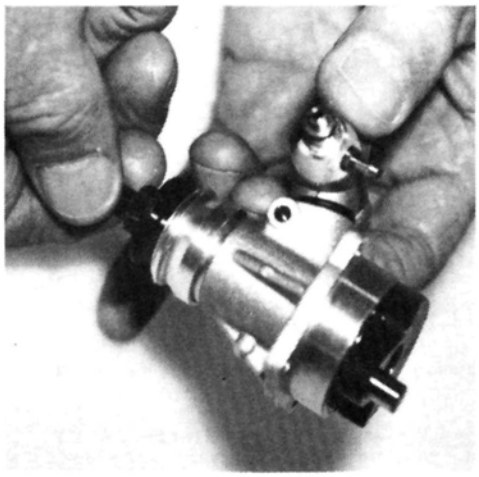
Dimensions were given on the drawings so that full-size plans were not needed.

The second gas-powered model to be presented in *Model Airplane News* in planform was the Bullpup, an 8-foot model designed by Hubert B. Lacey. Since all dimensions were given on the drawings, full-size plans were not sold for it. Free flight models ruled the sky, radio control was but a dream, and control line flying was a ways off yet, but that's the way it was in August 1936, fifty years ago this month. ■

Tech Tips! Troubleshooting

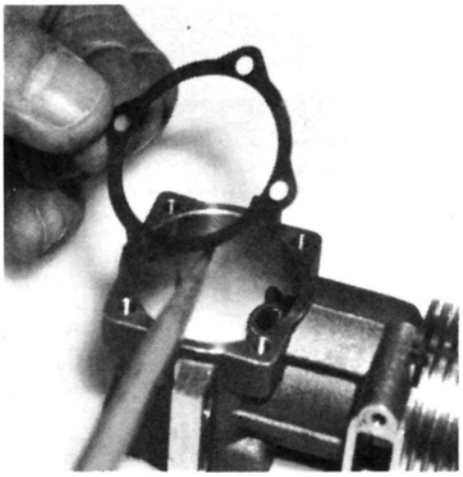
by DAN SANTICH

What can go wrong, will go wrong.



Left: Rotate crankshaft slowly by hand. Any rough feeling or catches mean trouble. Shaft should spin freely, ending with the counterbalance at the bottom of the plane of rotation.

Right: Engines that are equipped with gaskets sometimes leak at the crankcase. Check gasket for cracks or splits. If it needs to be replaced, be sure to use the same thickness material.

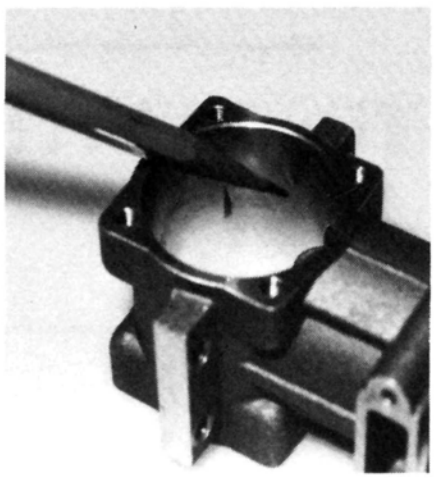


THE TWO-STROKE engine is one of the most simple, yet powerful creations used to fly our models. It, however, is not efficient nor is it quiet; yet for the majority of modeling practices, the two-stroke engine has found a permanent home.

All model engines purchased today are of excellent design and workmanship and the development path to this point has been paved by hundreds of modelers. Their efforts were to create a reliable, lightweight, and powerful method of propelling our models through the air. Each engine was a learning tool from which future engines would benefit.

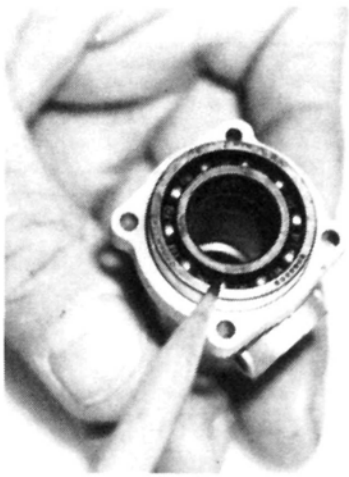
After nearly 60 years of practice, you would think that modelers would have the operation of two-strokes down to a science. Well, yes and no. Although they are probably the epitome of simplicity, these little gems can sometimes be downright devilish, leaving even engine experts at a loss for explaining a problem. Perhaps that is what makes them so lovable. Engine collectors can tell you a story about every engine they have in their collection. Each one has a personality unto itself with individual characteristics that make their operation an effort in applied science learned through experience, rather than textbooks or operation manuals. Unfortunately we often have to learn the hard way; by trial and error. Often the error leads to pieces of airplane spread out on the tarmac.

The number one rule to remember is not to attempt a flight if your engine is not running properly. We tend to believe that a sick engine will cure itself; but this is hardly ever the case. Just like a doctor, you must identify the problem or symptom, locate the source of the ailment, and administer proper treatment to cure the ills. This isn't as easy as it might seem, since many different things can cause the same symptom, and if we have more than one problem area, the chances of

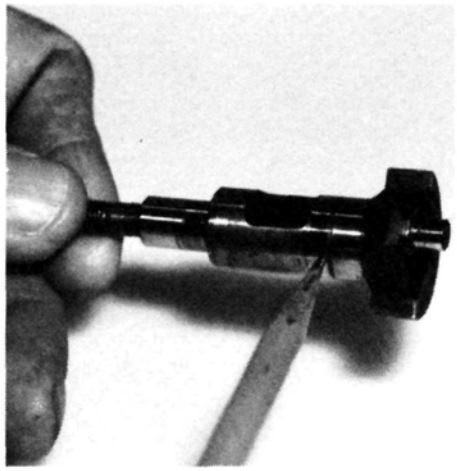


Left: Check the inside of the crankcase for score marks and cracks, especially around the mounting lug area. A crack will allow air in and upset the fuel draw.

Right: This bearing is shot. Rust has erroded the balls and the race extensively. The only solution is to change it.



Two-Stroke Engines



Left: Score mark on this crankshaft reveals that the bearing has seized up and has been spinning upon the shaft.

Right: Excessive buildup of glaze on piston liner causes engine to seize up at higher rpm, overheat, and generally run lousy. The same thing applies to the piston. Glaze must be removed.

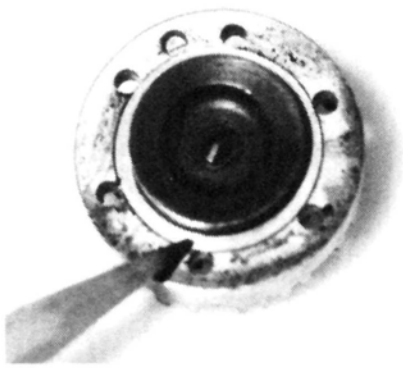
isolating them can become downright frustrating.

Let's look at a typical engine/tank setup. We have the engine, fuel line, and fuel tank. If we have a pump, filters, valves, etc., added to this system, then we compound the potential for problems as well as the ability to isolate the trouble spot.

In troubleshooting any problem the first thing to do is reduce the system to the lowest number of components possible. Of course some things become immediately apparent, such as fuel running out the back of your airplane or, upon examination of the engine in your airplane, it falls out in your hands. A loosely-mounted engine will never perform properly and it will shake the daylights out of radio components as well as causing fuel to foam. The same thing can happen if you use an unbalanced propeller or spinner.

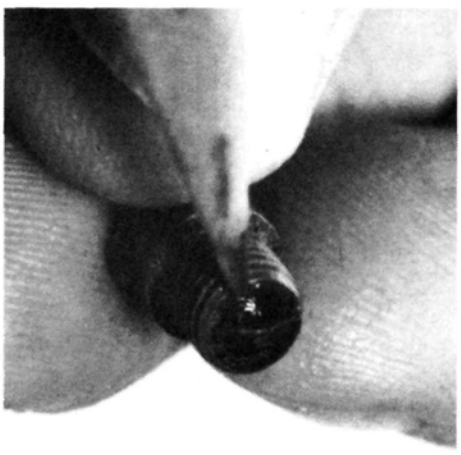
It's a pain in the neck to remove the engine and fuel tank from your airplane but a little effort and patience will really pay dividends. Sometimes there's no other choice, especially if you've checked the more obvious things, such as lines, filters, plugs, fuel, mounting screws, head screws, and carburetor. If they all check out, then pull the tank. Check first to see if there is any fuel residue in the tank compartment. If there is, you know you have a tank problem, but it still might not be the cause of the engine problem. Check to see that the clunk is on the pickup line and that none of the fuel lines are split. Seal off the tank and then pressurize it, looking for air leaks. Check the brass tubing for the pickup and vents to make sure they're not split or cracked. Make sure there are no water droplets in the tank. If the tank, lines, and filters are okay, your attention then must go to the engine.

Visual examination can often reveal a problem. First, make sure that all screws



Left: The seat on the head should be bright and unmarked. If it isn't, chances are it's warped and not mated to the liner properly.

Right: Your glowplug is a good indicator of proper engine operation. Excessive buildup of deposits means that the engine is running too rich or there is too much oil in the fuel. Carbon buildup on the plug limits the combustion capability.



are in place. For example, if a backplate screw is loose and that screw hole is open to the crankcase, you could be losing your crankcase pressure as well as suction at the carburetor. And, speaking of carburetors, see that it's seated properly in its mount and that the screws are in place.

Check the exterior of the engine very closely for any cracks, especially around the mounting lugs. If you detect any, your engine is a good candidate for the scrap heap. If there are no visible signs of cracks, leaks, or defects in the case or carburetor, all the screws are tight, the plug is good, and the fuel is known to be good, the only place left is inside the engine itself.

Remove the head, backplate, and front housing (if your engine has one), and pull the piston liner. If you have a ringed engine, be careful not to damage the ring, as they break very easily. Most ringed engines have a retainer pin which keeps the ring from rotating. If you remove the ring, make sure you observe this pin and reinstall the ring exactly as it was removed. If you don't, and you try to place the piston back in the liner, you'll break the ring immediately. Be extremely cautious here.

When disassembling an engine, always use a plastic container in which to put all the screws and small parts so you can find them later.

With the piston and liner out of the engine, put the crankshaft in place with a little oil (gun oil works well) and spin it in the case. It should spin freely and wobble back and forth as the counterbalancer seeks the lowest point. The counterbalancer is always opposite the crankpin. If it doesn't spin freely, or feels rough when you turn it by hand, chances are you have a bad set of bearings, or the bearings are not set up properly in the case, or are misaligned. Sometimes you can straighten them out and sometimes the case is warped beyond cure. A tight crankshaft can cause overheating and seizure, or simply give you fits with erratic runs.

Inspect the crankshaft for any abnormal wear. Score marks where the bearings are located mean that the crank is spinning on the housing of the bearing, which it isn't supposed to do. The balls of the bearing should be doing the spinning. With the housing spinning on the crankshaft, not only is a lot of friction and heat being generated, but a severe loss of power is resulting, as well as erratic operation.

The same thing applies to the crankcase of the engine. Check the seats where the bearings are housed and look for circular wear marks. There shouldn't be any.

The next things to check are the piston and sleeve. If there's a lot of carbon or varnish built up on them, they should be cleaned. In *Harry's Handbook for Miniature Engines,* Harry Higley recommends using 400 wet-or-dry sandpaper wetted in kerosene. This varnish should be removed because it inhibits the cooling ability of the engine, plus it acts as a drag upon the piston when the engine is operating. This creates heat and can cause the engine to seize up at a very inopportune time.

Of course there are other things that can cause your engine to run hot. A prop out of balance can cause fuel to foam. This gives a lean fuel mixture, which in turn causes the engine to run hot. Too much of this and you'll need another engine.

Bad fuel can also give you problems. Fuel that isn't stored properly can lose its punch, plus it can accumulate moisture. Also, if the fuel freezes and then thaws, the oil will separate and the fuel will look like one of those desk-top weights that snow when you turn them over.

The troubleshooting chart shown with this article gives some of the more obvious problem causes. If there is something you've encountered that I haven't listed or talked about, please let me know. The hobby is a very enjoyable activity, especially when everything works as it should. ■

TWO-STROKE TROUBLESHOOTING CHART

RUNS ERRATIC OR HOT

- Engine not broken-in
- Fuel line too small
- Glowplug shorted
- Glowplug blown

- Bad fuel
- Air leak in tank
- Air leak in line
- Kinked fuel line
- Debris in fuel line

- Carb leaking air
- Debris in filter
- Clogged needle-valve
- Loose engine

- Foaming of fuel
- Loose head
- Loose case screws
- Loose plug

- Bad plug gasket
- Leaking glowplug stem
- Blocked fuel vent
- Pickup in tank off
- Crack in crankcase
- Varnish in engine
- Bearings worn out
- Bearings defective
- Bearings misaligned
- Crank rubbing backplate
- Split tubing inside tank
- Propeller too large
- Improper carburetor setting
- Improper tank location
- Propeller out of balance
- Propeller too small

RUNS LEAN BUT NOT RICH

- Too much nitro

- Improper lubricant
- Defective plug
- Compression too high
- Fuel line too small
- Fuel line clogged
- Air leak in tank
- Air leak in line
- Air leak in carb

- Head screws loose
- Case screws loose
- Improper carb setting
- Improper tank location
- Fuel vent blocked

WILL NOT START

- No fuel

- Flooded
- Dead battery
- Defective plug

- Bad fuel
- Defective leads
- Loose plug
- Loose head
- Improper connection
- Wrong carb setting

WON'T IDLE

- Bad plug

- Bad Fuel
- Loose carb
- Wrong carb setting

- Case screws loose
- Head screws loose
- Plug loose
- Fuel line too large
- Leak at carb base

VIBRATES

- Prop not balanced

- Spinner defective
- Bearings shot
- Rod is bad

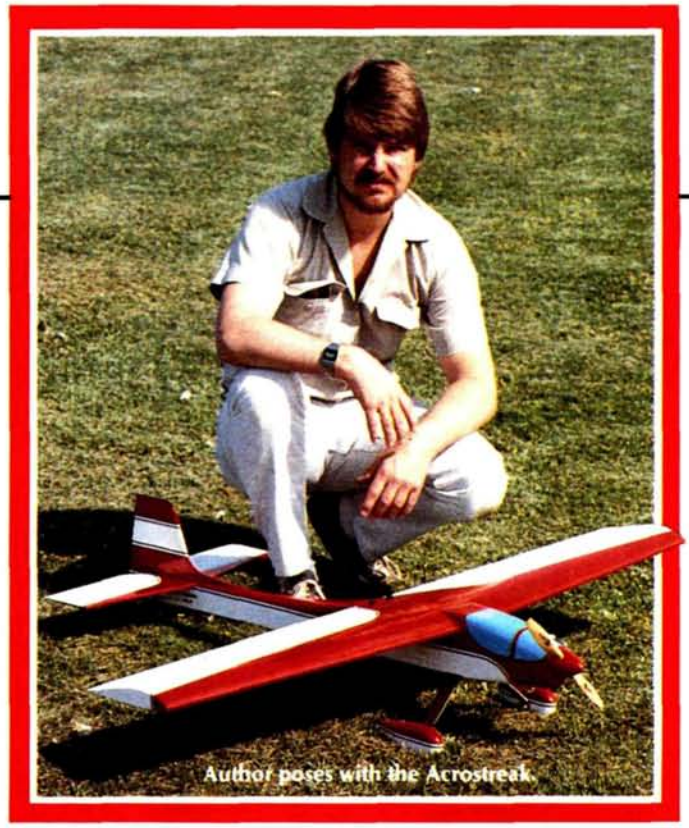
- Crank not aligned

RUNS A SHORT TIME—QUITS

- Pickup off in tank

- Clunk off line
- Defective plug
- Clogged filter

- Clogged carb
- Loose carb
- Loose needle
- Plug bad
- Improper tank location
- Blocked vent
- Fuel line too large
- Prop too large


Author poses with the Acrostreak.

Acrostreak

by TOM STRYKER

A highly maneuverable, aerobatic design for both four-strokes and two-strokes.

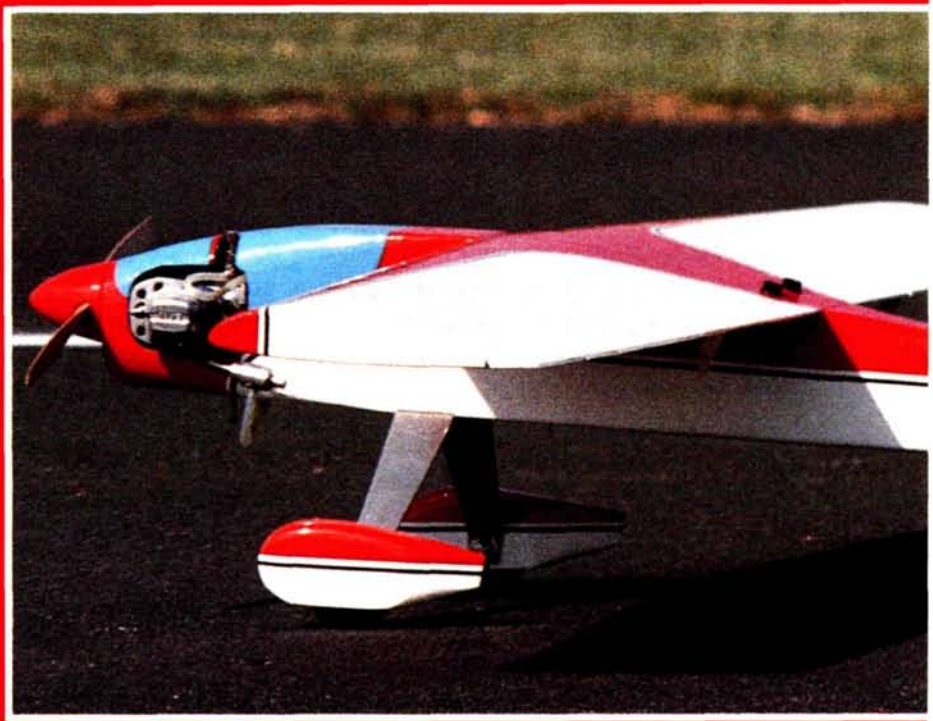
Specifications

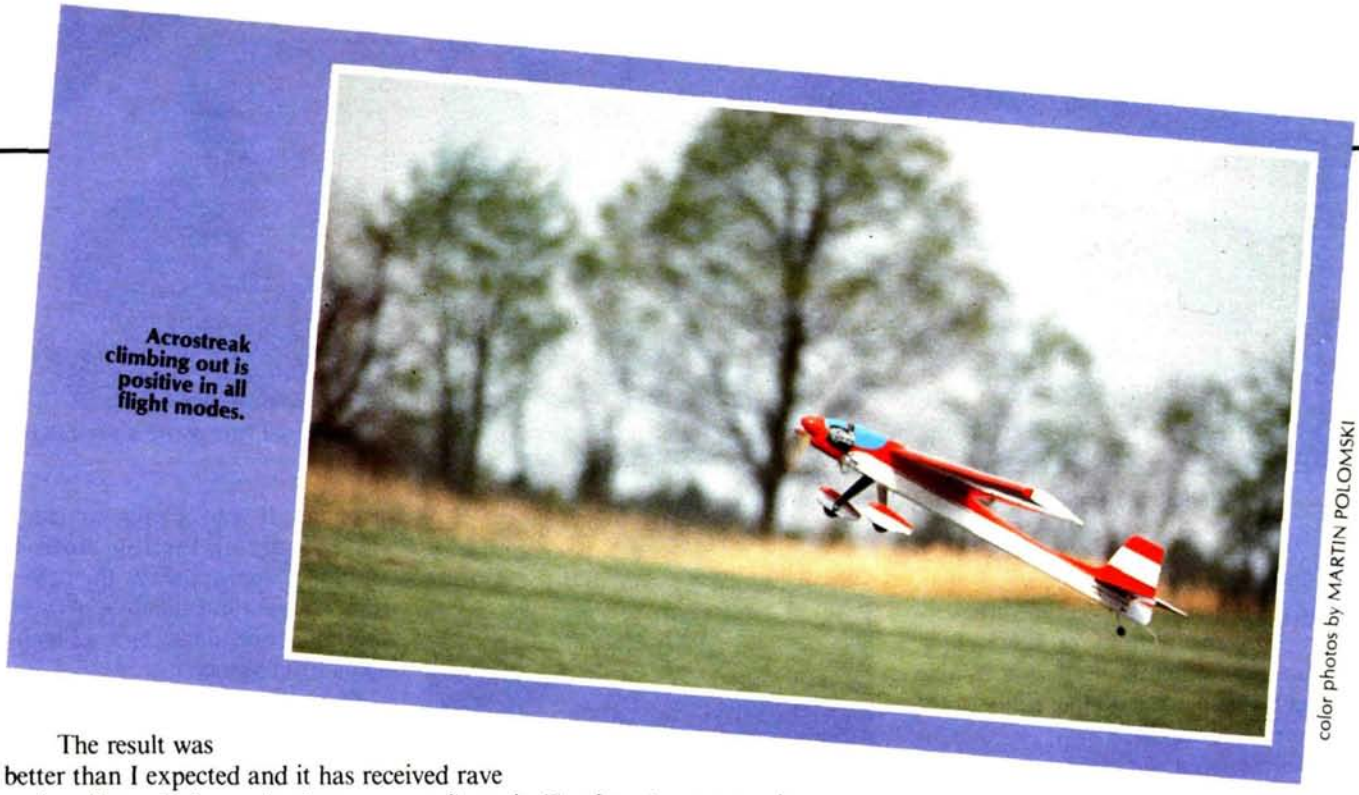
Type: *Sport*
Span: *53¾ inches*
Area: *518 square inches*
Length: *47¾ inches*
Weight: *4-4½ pounds*
Engine: *.35-.40 two-cycle*
.46-.60 four-cycle
Channels: *4*

IN AN ATTEMPT TO create the perfect competitive fun-fly plane, I developed the original version of what is now called the Acrostreak. The following requirements had to be met: it had to have high lift and low drag to permit long power-off glides; it had to be lightweight for short takeoffs and fast climbs; it had to have low-speed stability for slow flight; and it had to have high maneuverability for everything in between. After a couple of modifications all requirements were met and exceeded, and the aircraft fared very well in the local fun-flies.

After a location change, my interests shifted to Pattern flying, and the original Acrostreak was relegated to collecting dust; hanging from my workshop ceiling. Recently, a flying buddy converted to four-strokes and purchased a neat Enya 46-4C. But he found that the selection of good, aerobatic airplane kits for that size engine was a little slim.

After noticing my fun-fly plane in its rather undignified spot on the ceiling, he asked what it would take to modify it for his engine. The creative wheels started turning! Instead of modifying this fuselage (for the greater length of the four-stroke), I decided to use the same wing and stab, and design a new fuselage and fin/rudder. The goal was an easy-to-build attractive airplane with good flying characteristics. I lengthened the fuselage between the wing and stab for stability, but kept a fairly short nose moment, so the extra weight of a four-stroke wouldn't cause a nose-heavy condition.





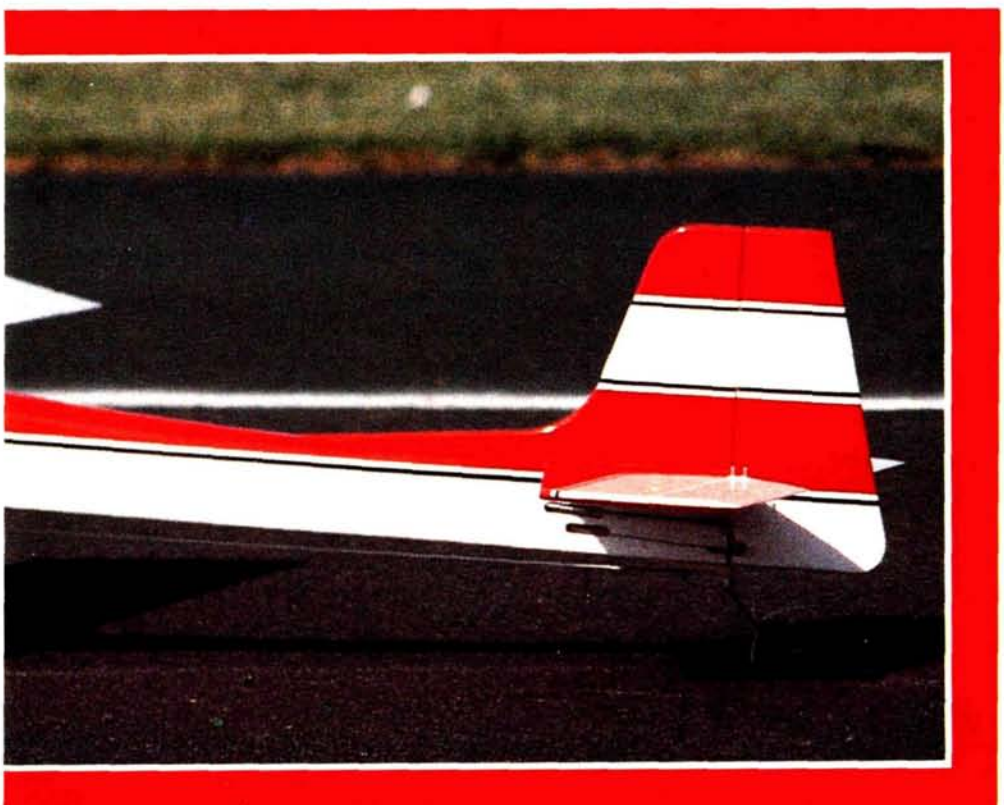
Acrostreak climbing out is positive in all flight modes.

color photos by MARTIN POLOMSKI

The result was better than I expected and it has received rave reviews from all those who have seen or flown it. Forgive me for boasting, but this is a very versatile design that does everything well! So, if you're looking for a project that is easy to build, pure pleasure to fly, and will bring you many compliments at the flying field, then read on.

CONSTRUCTION. The fuselage is a basic box structure using triangle stock in most corners to allow for a rounded appearance. It builds very quickly and conventionally, so I'll simply highlight a few areas. I used Goldberg* Super Jet for almost the entire building process. Any medium or high viscosity cyanoacrylate works fine.

Cut out all parts and draw centerlines on each. Cut relief slots into the triangle stock to allow contouring to the fuselage as shown on the plans. Note that the two top/front triangle pieces will have slots cut in two directions. Taper the top/rear triangle pieces so they will fit together when the fuselage sides are joined. Taper the very end of the fuselage sides so they will also fit together. Cut out pushrod exit holes and sand a slight groove ahead of them on the insides of the fuselage side to allow for wire clearance.

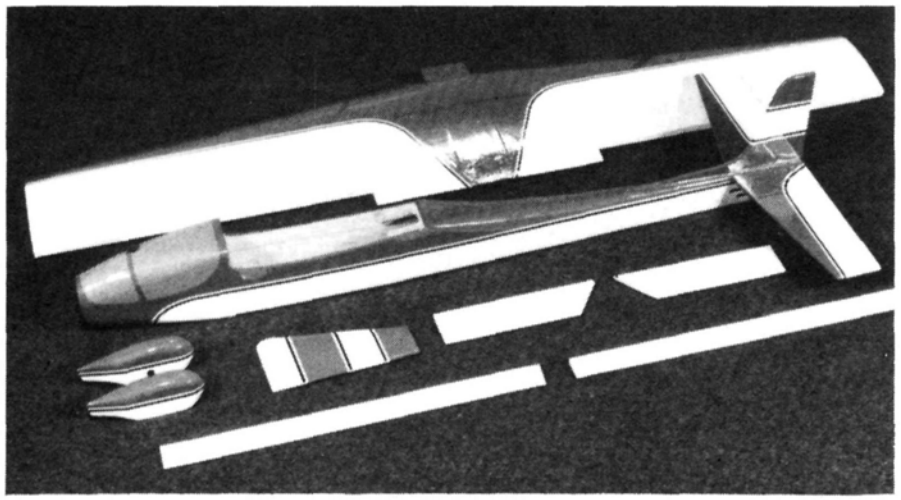


Attach the triangle stock and bottom stringers to the fuselage sides. Join the fuselage sides while inserting F-1, F-2, and F-6. Be sure to align F-1 for the proper right thrust. Pull the nose together and attach the nose block. Add F-5 and then the top and bottom ⅛-inch sheeting.

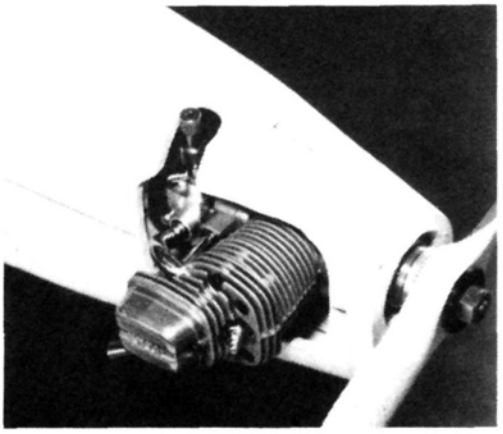
Shape up the fuselage around the triangle stock areas with X-Acto blades and 80-grit sandpaper. Use your creativity to get a nice rounded appearance on the top and around the nose. After completing all the sanding, remove the wing filler immediately behind F-2.

Hold the fuselage on its nose and pour some 5-minute epoxy into the fuel tank area to create a fillet between F-1 and the fuselage sides.

Assemble the tail from ¼-inch medium to hard sheet. Cut out a ½x6-inch slot in the center of the



Completed components of Acrostreak show good engineering.

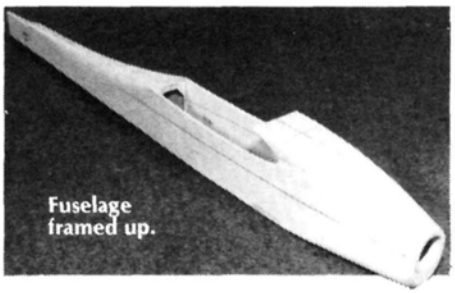


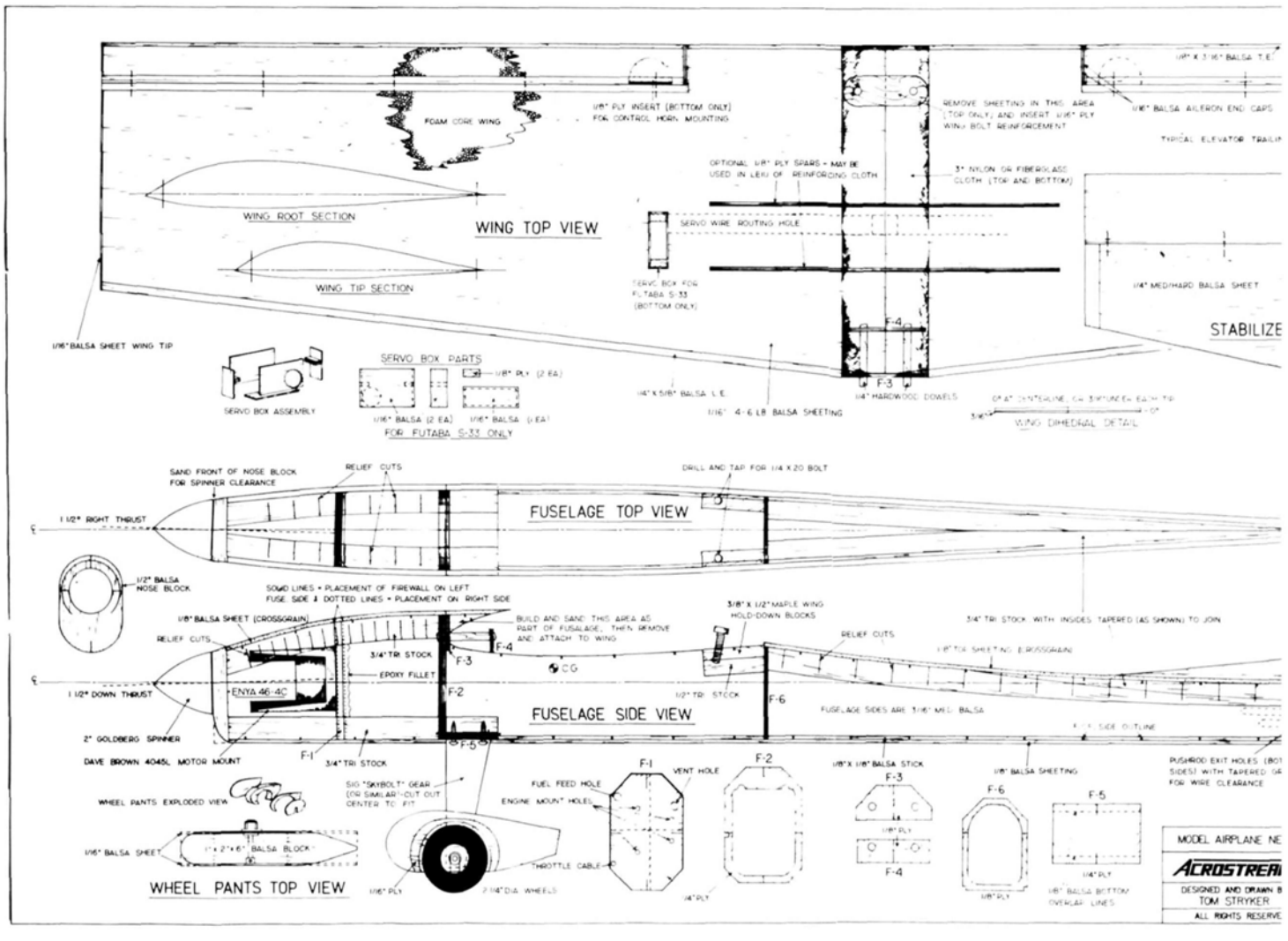
Author used Enya 46-4C with good results.

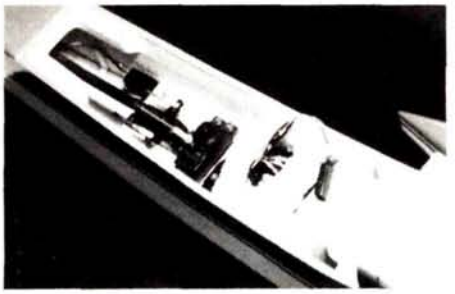
stabilizer and insert a hardwood spar. Also insert the hardwood tailwheel support into the bottom of the rudder. Round the fin and stabilizer leading edges and taper the trailing edges of the elevator and rudder.

For the wing, cut out the foam cores and prepare the 1/16-inch sheeting. Use 4- to 6-pound contest-grade balsa if possible. If you prefer to use spars instead of reinforcing cloth for a smoother appearance at the center section, then cut out the full-depth slots in the cores and make two 12-inch long spars from 1/8-inch ply.

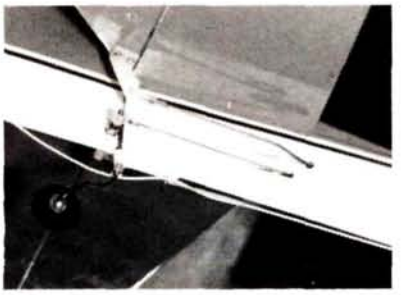
Sheet the cores using your favorite method. I suggest using a slow-cure epoxy and letting them dry overnight in their cradles, with about 100 pounds of weight evenly distributed over each panel.







Radio compartment houses any setup you want.



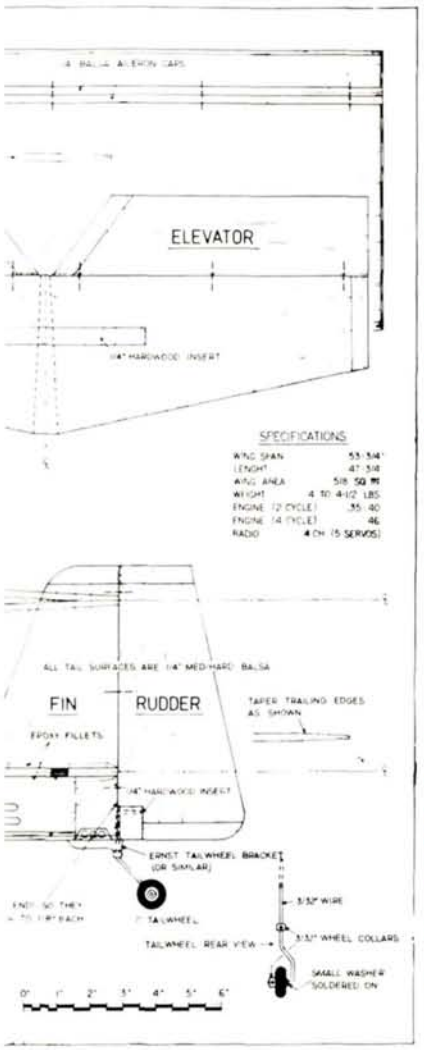
Control linkages should be positive and slop-free.

Next add the ¼-inch leading edge, the ⅛-inch trailing edge, and the 1/16-inch wing tips. Cut out the ailerons and add the ¼-inch and 1/16-inch balsa caps.

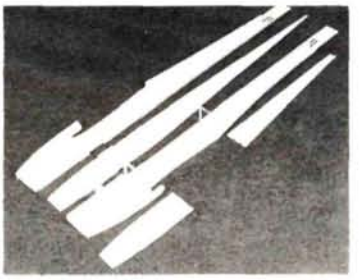
Build servo boxes for your choice of servos. I used Futaba's* S-33 servos as shown on the plans. Cut a hole in the bottom of each wing, insert the boxes, and secure them with epoxy. Open an access hole from the wing center section to each box for the servo wire. A piece of ½-inch brass tubing heated with a propane torch works well for this. Angle the holes so they end up just below the bottom sheeting at the center section.

Insert the spars, if used, and join the wings with epoxy. There is no dihedral, so the trailing edge should be straight across. Cut the wing bolt reinforcing plate from 1/16-inch ply. Trace around it on the location shown on the plans, then remove the balsa sheeting in this area and replace it with the plywood plate.

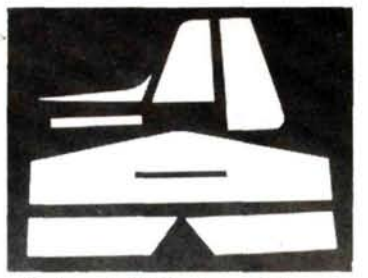
(Continued on page 104)



FULL-SIZE PLANS AVAILABLE...PAGES 124, 125



Fuselage sides and bulkheads prior to joining.



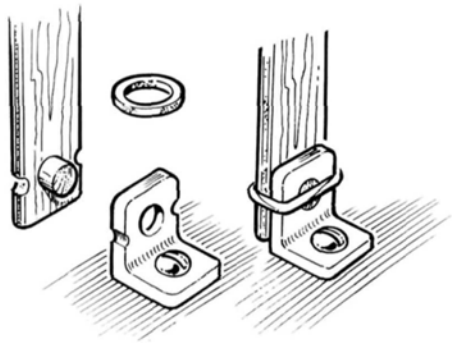
Stab parts. Note plywood insert.

Wheelpants fabricated from balsa.

Hints & Kinks

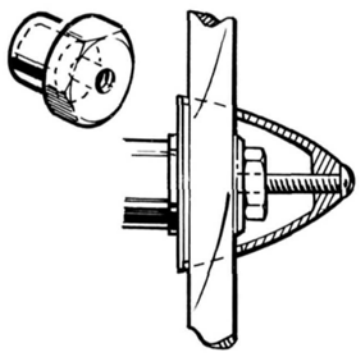
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



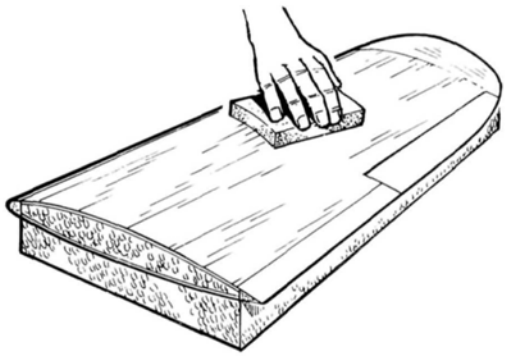
Here is a **very** neat biplane strut fixing which remains firm in flight but which will pop out instantly in an accident or for derigging. The L-bracket can be cut from a control horn if you don't have a commercial bracket to hand. The hole should match the short stub of dowel protruding from the strut, I'd recommend at least 3/16-inch diameter (5 mm). The rubber bands can be sliced from surgical rubber tube or use an O-ring. *John Bishop, Hoffman Estates, Illinois*

This is a mini polishing buff made from a Q-Tip, but how do you prevent the plastic stem from breaking when used in a Moto Tool? This modeler inserts a close-fitting piece of wire into the stem, stopping just short of the cotton bud. A piece of pushrod wire seems about the right diameter.
Lenny Bohlin, Helsingborg, Sweden

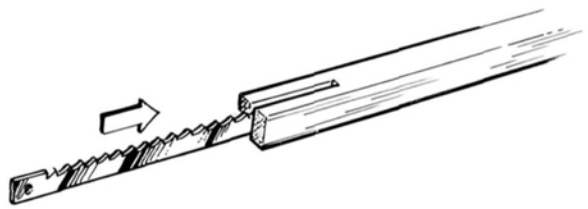


The big Enya .90 and 1.20 engines are very easy to adapt to spinner fittings. The special prop nut on these engines has a small hole in the center which can be opened out and tapped either 8-32 or 10-32 to suit your spinner screw.
Dick Roush, Canton, Ohio

We are all for making needle-valves easier and safer to reach and here is another method. Some glue bottles have a small plastic cap with serations. Our contributor quaintly advises to "stuff the cap with wood," which should be held in with cyanoacrylate glue. Drill the wood dowel to suit the wire extension, then glue in the roughened wire also with cyanoacrylate. Having just driven over one of mine, I observed that a tire valve dust cap would also make a good extension knob. By cutting the wire and soldering in a piece of, say, speedometer drive cable, the extension can be clipped back at an angle to get the knob even further from the propeller. *Youssef Gallad, Cairo, Egypt*

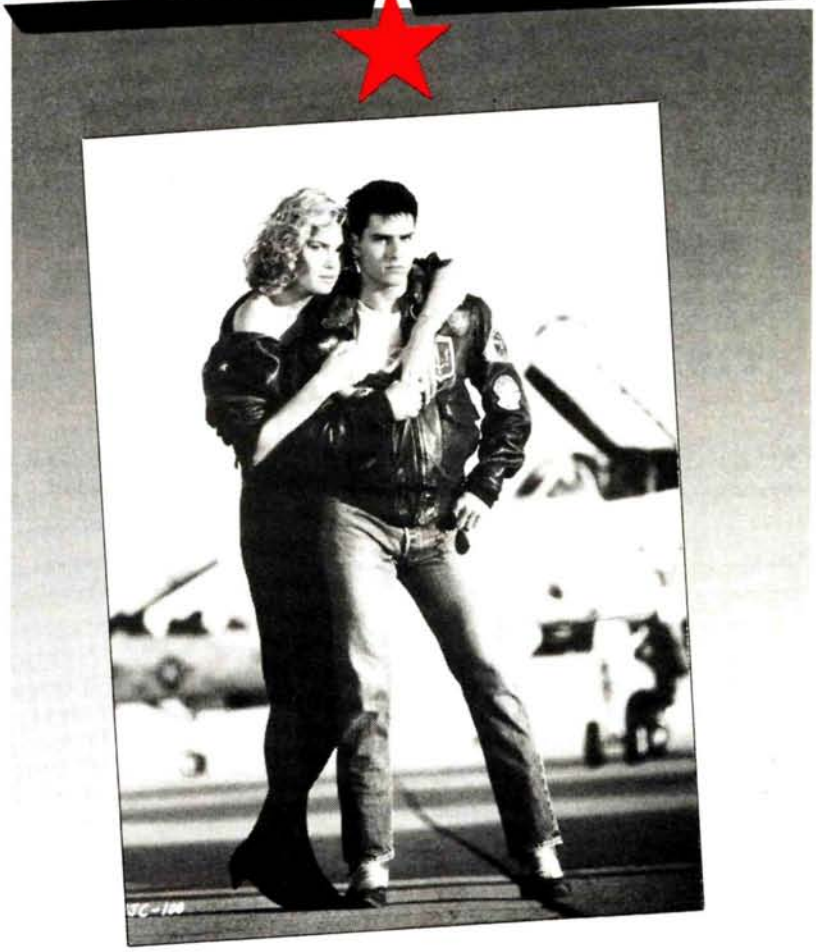


There is nothing worse than having that newly skinned wing rocking around on the bench while you frantically try to sand it smooth. Save the foam nest from which your wing cores were cut. These nests will securely support most wings and also save them from the inevitable bench rash from glue blobs and stray pins. *Bob Janulis, Chesterton, Indiana*



This is a useful little tool, quickly fashioned from a Dremel saw blade and a suitable stick. The blade is glued into the slot with Hot Stuff or similar and the point to take note of is that the blade is set to cut on the **pull** stroke. Where would you make use of this saw? Deep inside a fuselage, for instance, where a little more clearance for a pushrod is being cut from a former. *Bob Stover, Colgate, Wisconsin*

TOP GUN



"A Top Gun instructor once told me there are only four occupations worthy of a man: actor, rock star, jet fighter pilot or President of the United States."

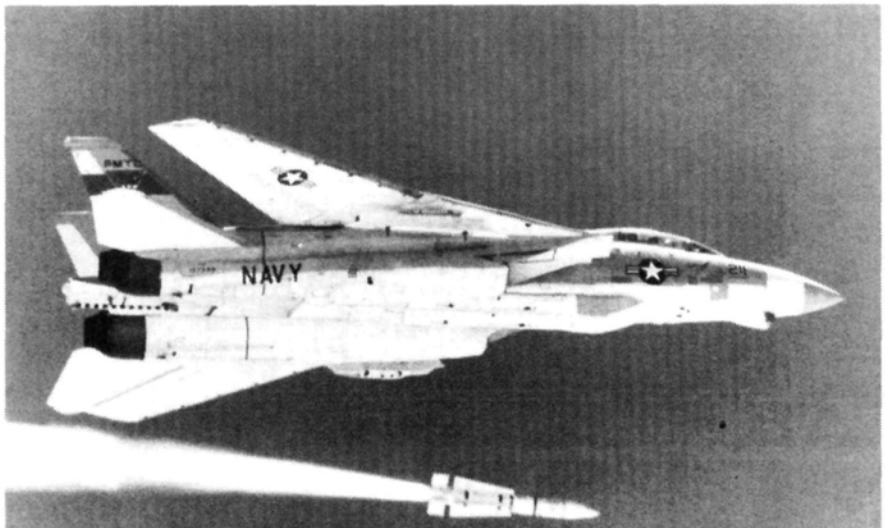
—Actor Tom Cruise

IT IS early morning at San Diego's Miramar Naval Air Station as Lt. Pete "Maverick" Mitchell and Lt. Nick "Goose" Bradshaw climb into the sleek silver cockpit of an F-14 Tomcat. Built at a cost of $36 million per aircraft, the F-14 can climb 30,000 feet in one minute, fly at more than twice the speed of sound and haul seven tons of weaponry.

It is the U.S. Navy's supreme machine.

Oblivious to the deafening roar of jet engines starting up around them, Mitchell and Bradshaw drop the canopy, give the ground crew the "thumbs up" sign and slowly begin a taxi to the runway.

Left, top to bottom: Beautiful Kelly McGillis stars as an astrophysicist teaching at the Navy's Fighter Weapons School. James Tolkan as Squadron Leader "Stinger," whose mission is to train the best jet fighter pilots. The unorthodox Weapons School instructor, Michael Ironsides. Navy Fighter Weapons School Officer Skerritt (right) and Ironsides watch a training exercise by the best pilots. The icy-cool F-14 jock Val Kilmer is Tom Cruise's nemesis in "Top Gun." All photos printed with the permission of Paramount Pictures.



The lethal Navy F-14, the real star of "Top Gun," launching a malevolent Phoenix missile.

While awaiting a green light from the tower, the Tomcat appears to be cooking on the concrete, shimmering in a wave of heat, when suddenly the jet rises. Soon, a trail of fumes and two glowing pink afterburners are all that remain visible of the aircraft as it climbs 2,000 feet, banks sharply to the right and disappears over the ocean...in search of the fight.

For the next five weeks, Maverick and his Radar Intercept Officer Goose are part of an elite corps of officers who many believe to be the best jet fighter pilots in the world. They are students at the Navy's prestigious Fighter Weapons School, also known as Top Gun. The objective of the Top Gun program is to identify the Navy's brightest pilots, its sharpest shooters, and then train them until they're *more* than the best in the West—they're the best in the world.

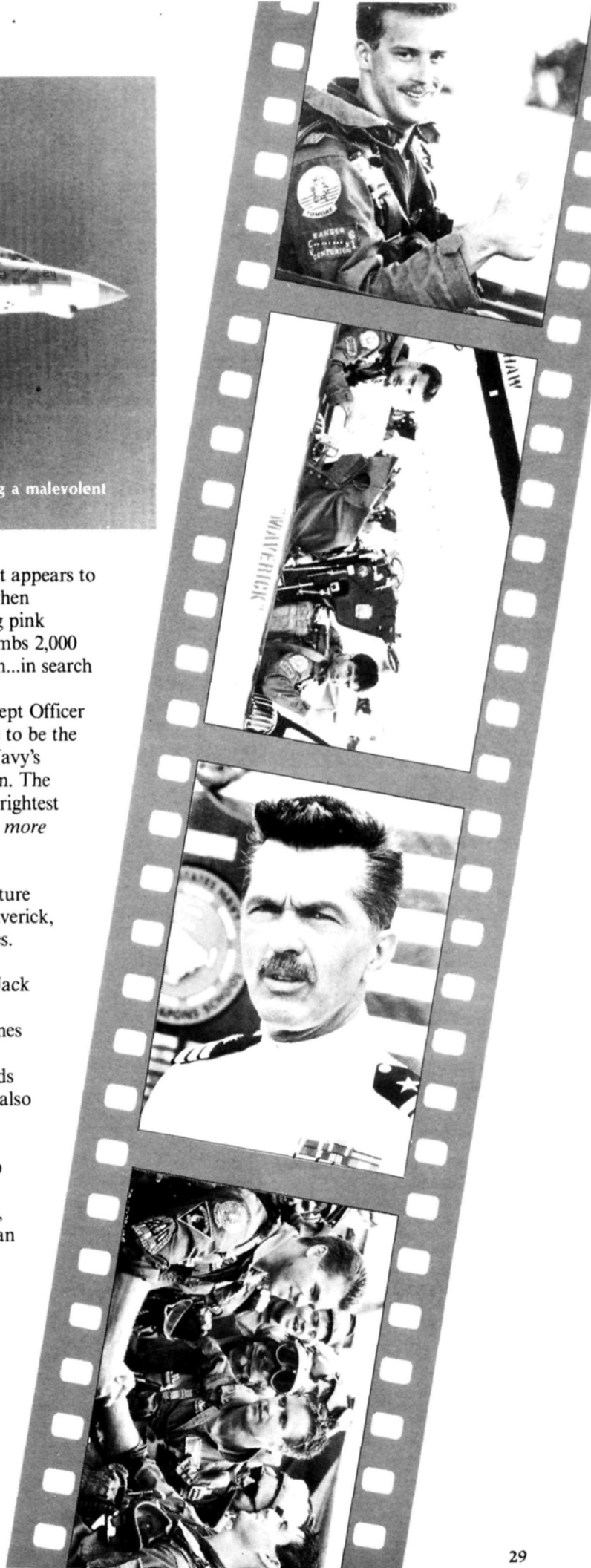
Paramount Pictures' "Top Gun," a Don Simpson-Jerry Bruckheimer Production, is an exciting contemporary adventure starring Tom Cruise and Kelly McGillis. Cruise portrays Maverick, a skilled F-14 pilot who flies by instinct rather than rigid rules.

Produced by Don Simpson and Jerry Bruckheimer and directed by Tony Scott from a screenplay by Jim Cash and Jack Epps, Jr., "Top Gun" gives Kelly McGillis the role of an astrophysicist and Top Gun Instructor who cautiously becomes involved with Cruise while he is her student. Tom Skerritt portrays the Top Gun commanding officer, Anthony Edwards has the strong role of the easy-going Goose, and Val Kilmer also stars as Iceman, a perfectionist who instantly becomes Maverick's dogfighting rival for best in the air honors.

Also featured in the film are Michael Ironsides as a Top Gun instructor, and student pilots are played by Rick Rossovich, Barry Tubb, Whip Hubley, Clarence Gilyard, Jr., Kayvan Pasdar, Tim Robbins and John Stockwell. Meg Ryan is cast as Goose's wife, Carole, and James Tolkan is a squadron leader.

"Top Gun" marks the fourth creative collaboration for the highly successful motion picture producing team of Don Simpson and Jerry Bruckheimer, whose most recent film was Paramount's "Beverly Hills Cop," the box office

(Continued on page 121)



Right, top to bottom: Anthony Edwards portrays the easy-going Radio Intercept Officer "Goose." Pilot of his F-14 is Tom Cruise. The "Goose" and Tom Cruise as "Maverick," an awesome team. Tom Skerritt portrays Mike "Viper" Metcalf, the commanding officer at the world's best weapons school. Flying school rivals Kilmer (left) and Cruise shake hands as they receive a hero's welcome after downing three enemy MiGs. All photos printed with the permission of Paramount Pictures.

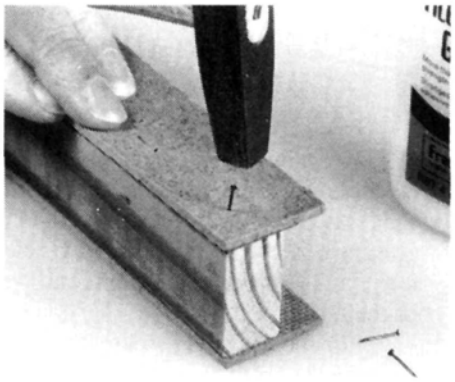
How To:

by RANDY RANDOLPH

MAKE A MITER BOX

The advent of the new super glues that are wicked into joints make it essential that the joints fit properly. One way to be sure of square cuts in wood is with a miter box. The one shown in the photos is easy to make and also offers a simple and accurate way to produce gussets as well as right-angle cuts.

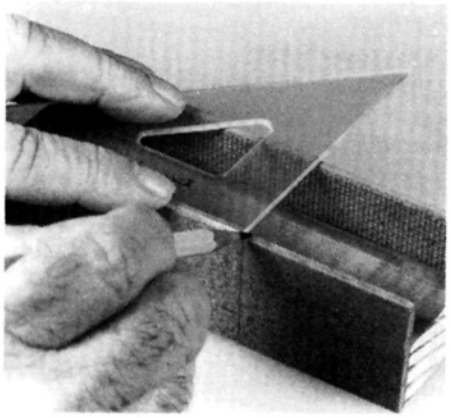
1.



2.

1. The required materials are a 6-inch length of 1x2-inch hardwood, two 6-inch lengths of 2-inch wide masonite, glue, and some brads. The tools include a hammer, a razor knife, a pencil, and a right-triangle.

2. Glue the masonite strips on both sides of the 1x2 so they are flush with the bottom as well as the ends. Hold them in place with three or four brads on each side while the glue dries. Masonite works better than wood in this application.



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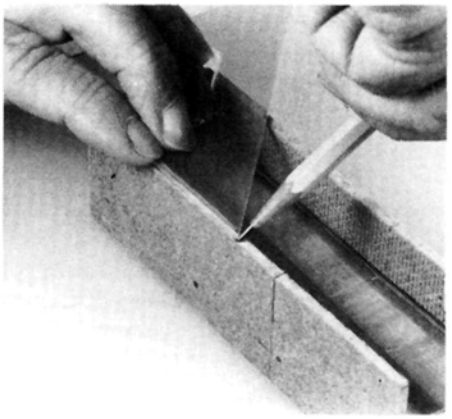


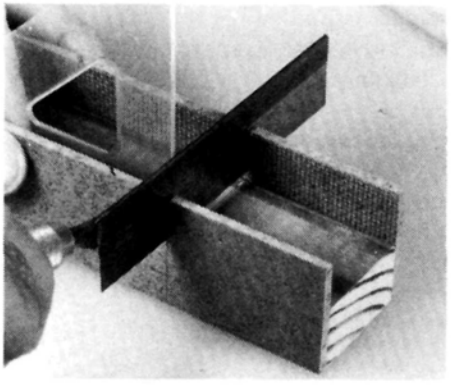
4.

3. Measure 1½ inches from one end and use the right-triangle and pencil to mark a vertical line up the side and then across the top of both sides. The accuracy of the tool depends on these marks, so use care.

4. Using the 45° side of the right-triangle, mark across the top of the box about 1 inch from the first set of marks to form the 45° miter. Again, use care.

5. Using the right-triangle as a guide, saw down through the marks at right angles to the top of the box, then through the 45° marks. Saw until the blade makes a shallow notch on the 1x2 base.

6. The completed miter box. Hold the wood to be cut flush against the side nearest to you when making cuts. Gussets are made by using the 45° notches and reversing the side against the edge after each cut.



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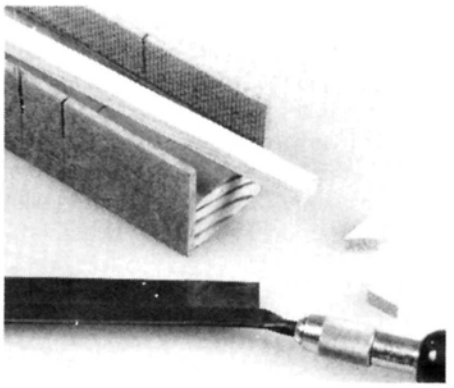
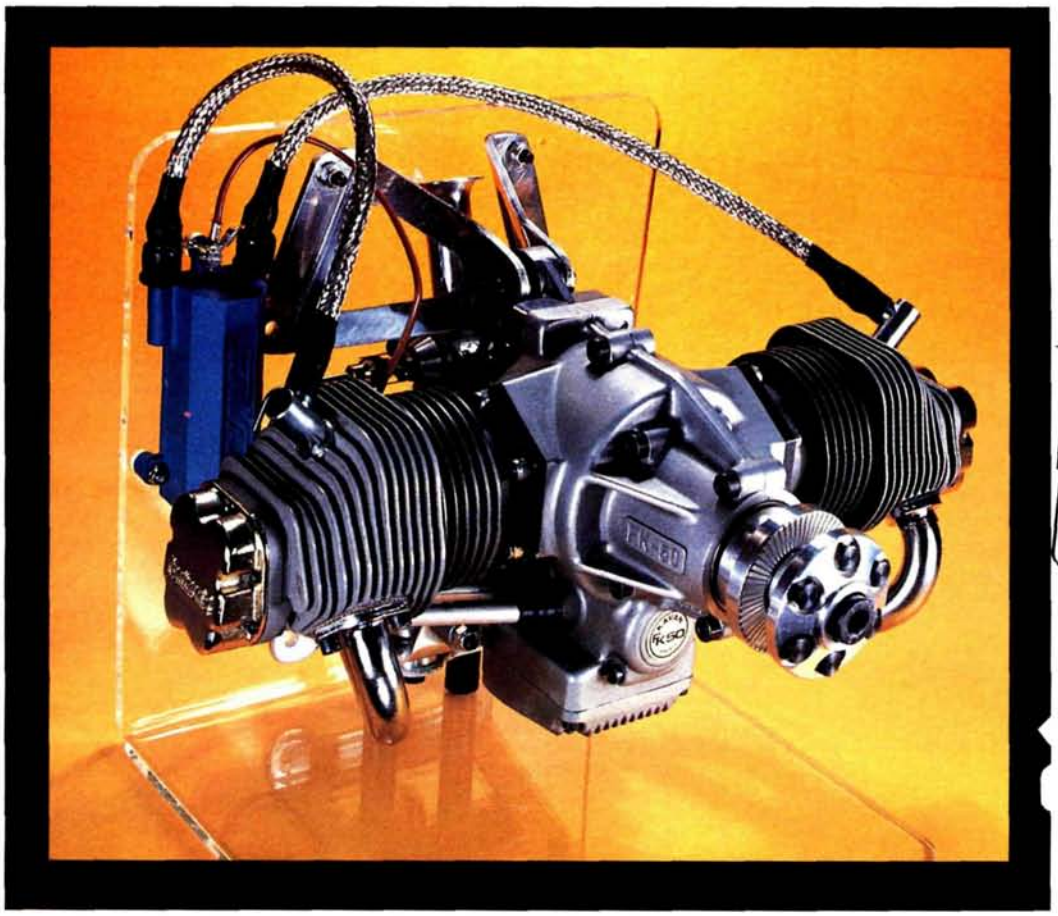
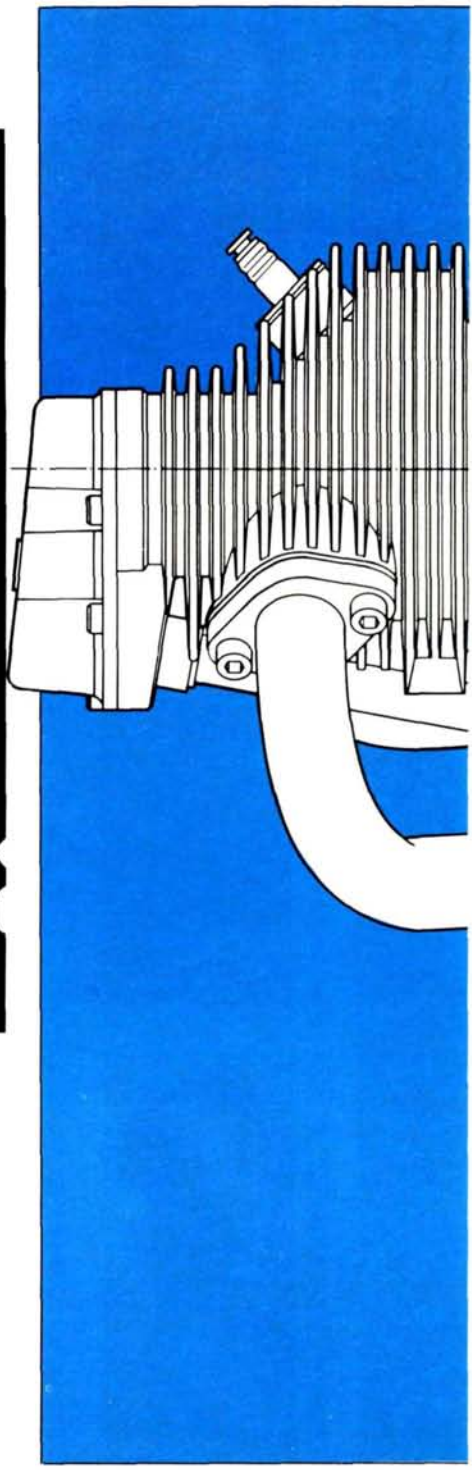


6.

Engine Review

Kavan FK-50 MK. II





SPECIFICATIONS

Type: Horizontally-opposed twin-cylinder, alternate-firing spark-ignition four-stroke-cycle with pushrod-operated overhead valves. Three ball-bearing crankshaft. Twin ball-bearing camshaft. Throttle type carburetor with exhaust-heated inlet manifold.

Checked Weights: 2.48 kg (5.47 lb) including muffler and firewall mounting brackets; 2.92 kg (6.44 lb) with ignition equipment and 1200 mAh nickel-cadmium battery pack.

Displacement: 50.84cc (3.103 cu in.)

Bore: 34 mm (1.339 in.)

Stroke: 28 mm (1.102 in.)

Stroke/Bore Ratio: 0.824:1

Compression Ratio: 8.6:1

Performance Data—as tested:

Power Output, net: 3.95 bhp at 8,850 rpm

Torque, net: 490 oz-in. at 6,700 rpm

Equivalent b.m.e.p.: 124 lb/sq in.

Specific Output, net: 1.27 bhp/cu in.

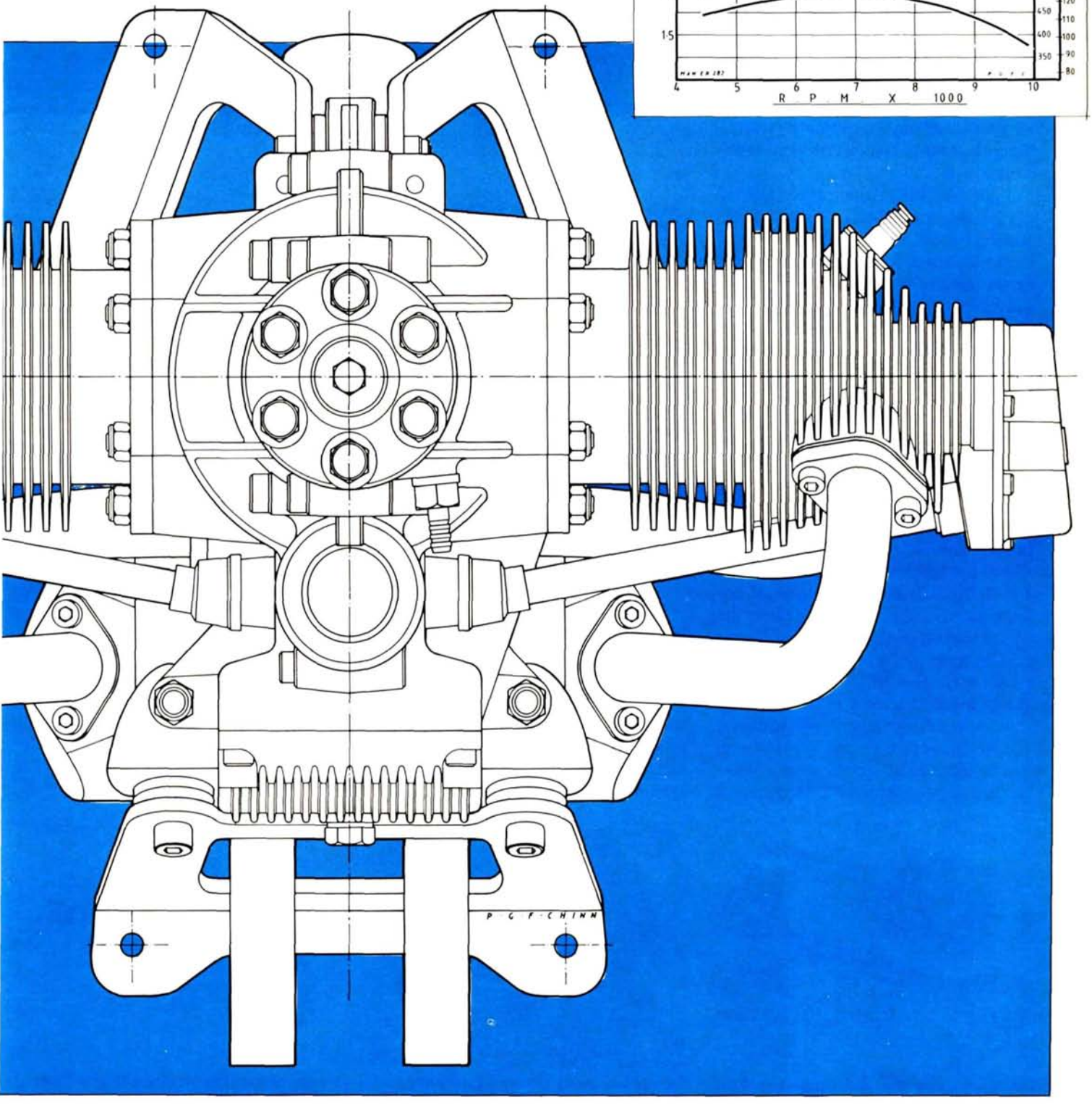
Power/Weight Ratio: 0.61 bhp/lb (including mount, muffler and ignition equipment).

Manufacturer: Franz Kavan, 8500 Nuremberg 10, West Germany.

U.S. Sales: Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728-8610.

by PETER CHINN

TWENTY YEARS ago—even ten years ago—the prospect of a model manufacturer introducing an engine like the Kavan FK-50 would have been regarded as so much pie in the sky. Those were the days when a "big" engine meant a 0.60 cu in. single-cylinder two-stroke motor; small enough to be comfortably held in one hand and weighing around 16 ounces.

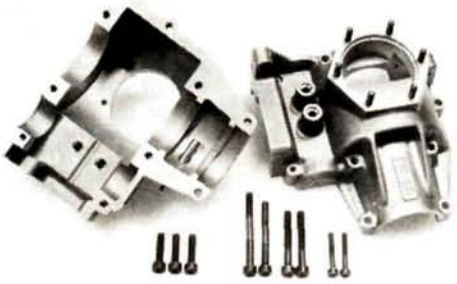


By the mid nineteen-seventies, the first tentative steps were being taken to interest modelers in four-stroke-cycle engines, although, at that time, these were no bigger and were less powerful than existing two-stroke R/C engines. On the other hand, the development of a new breed of aircraft, the "quarter scale" model, was seeing the adoption of small ex-chainsaw two-stroke gasoline engines capable of producing the torque required to turn the big propellers necessary for these models. Nevertheless, all this was a long way from anything remotely resembling the four-horsepower Kavan four-stroke twin.

Thus, in 1982 when the original glowplug-ignition Mk.I version of the Kavan FK-50 was introduced, it was totally different from any other engine on the market. It was also just about the most expensive. This, plus the fact that early production models suffered some teething troubles, may well have been responsible for the FK-50's attracting less attention than might have been expected. However, since that time, other extra-large twin-cylinder four-stroke engines have appeared (e.g. O.S. FT-240 Super-Gemini and Saito FA-270T) and one suspects that a climate of interest now exists in which the FK-50 will attract greater attention than before. Certainly the latest and much improved FK-50 Mk.II deserves consideration, not least because it is now available in the U.S. at substantially less than the original list price of the Mk.I.

Actually, the FK-50 Mk.II is still pretty much in a class of its own. Not only is it still the largest twin-cylinder model four-cycle engine currently in production; it also incorporates a number of full-size engine features that, as a whole, set it apart from other current production model aircraft engines. These include its use of a separate lubrication system, an electronic spark-ignition system with automatic advance and retard, an exhaust heated inlet manifold and special elliptic-skirt pistons with oil-scraper rings. It also includes several structural features normally found only in full-size engines.

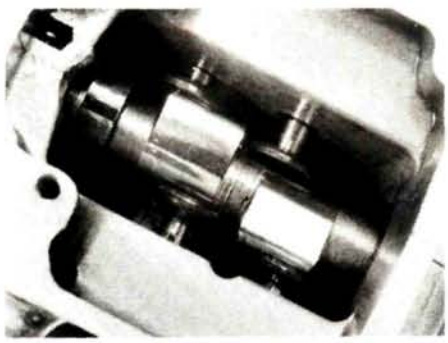
Kavan FK-50 Mk.II with ignition equipment fitted. Engine performed impressively on test.



Vertically-split crankcase, showing bearing housings, cam follower guides and cylinder mounting studs.

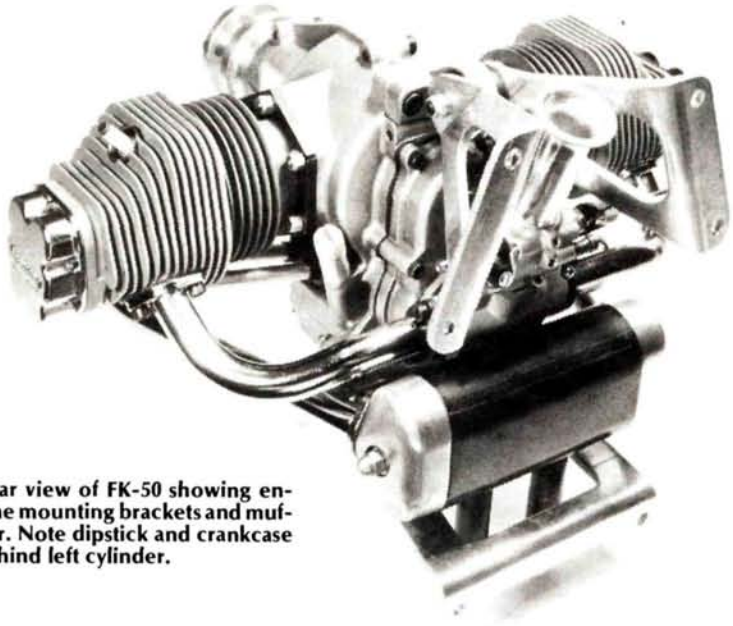
The present engine's immediate glowplug-ignition predecessor was briefly dealt with in the December 1985 "Engine Review Round-Up" feature. Outwardly, apart from the obvious addition of spark ignition equipment, the latest engine is identified by gold (instead of black) colored valve rocker covers and by a lengthened inlet venturi on the carburetor. As previously explained, the basic design of the FK-50 was inspired by the Continental Motors Corporation's horizontally-opposed light aircraft engines of the pre-war period and due acknowledgement of this is seen in the "Continental" logo on the rocker covers. The engine is pretty big: it needs a front bulkhead or firewall at least 7 inches deep; it is 10½ inches wide and it weighs nearly 6½ pounds with ignition equipment and a

Crankshaft, camshaft and supporting ball bearings. Extra cam is for operating oil pump.



Oil pan and pump removed from bottom of crankcase to reveal camshaft and offset mushroom cam followers.

Timing gears. Large (camshaft) gear incorporates magnets for electronic ignition system.



Rear view of FK-50 showing engine mounting brackets and muffler. Note dipstick and crankcase behind left cylinder.

1.2 ampere-hour battery pack. Its displacement of over 50 cubic centimeters compares with 40cc and 45cc for its nearest flat-twin four-stroke rivals.

Let's take a closer look at the engine's design and construction:

Latest FK-50 has revised pistons with Dykes compression ring and oil drain holes below scraper ring.

CRANKCASE AND OIL PAN. Assembled from two aluminum investment castings, the crankcase follows familiar full-size practice in being split vertically. The two parts are joined by seven 4 mm and two 3 mm hexagon socket cap screws. A single brass tube dowel, plus the three main bearings and two camshaft bearings, serve to align the two halves.

At its base, the crankcase assumes a rectangular shape to which the oil-pan is attached with four 3 mm cap screws. The oil-pan, another aluminum casting, is neatly finned underneath and is fitted with a magnetic drain plug—the first time such a device has been seen on a commercially produced model engine. That this actually works was proved during our tests. The sump contains 30cc of motor oil and the oil level is checked by means of a machined aluminum screw-in dipstick which is located at an angle towards the rear left side of the crankcase.

CRANKSHAFT, BEARINGS & PROP DRIVE ASSEMBLY. The two-throw counterbalanced crankshaft is machined from a steel forging. It has 15 mm diameter main journals and 13 mm diameter x 9 mm wide crankpins. The shaft is carried in three 15x32x9 mm ball bearings, two at the front and one at the rear, the outer front bearing being of the shielded type.

The two front bearings are axially distanced from each other within the crankcase, in the usual way, at their outer rings. As the forward portion of the crankshaft is of constant diameter which, with the type of prop drive assembly used, would otherwise have allowed the two inner rings to be drawn towards each other as the prop was tightened (thereby causing the bearings to bind), these are separated by a 22.72 mm long, 19.0 mm o.d. tubular spacer. The 40 mm prop driver is of machined aluminum and is mounted on the crankshaft nose with a steel split taper collet. An unusual feature, this is combined with a 2 mm wide Woodruff key that engages the slot (nominally 2.5 mm wide) in the collet.

The method of prop retention is surprisingly simple for such a large engine—and a four-stroke at that. It consists of a single 8 mm (M8 x 1.25 thread) socket head cap screw and a machined 39.7 mm diameter aluminum retaining washer. The hexagonal heads of what appear to be six through-bolts are, in fact, dummies, put there as an aid to realism. It might be supposed that this assembly would be insufficient to ensure prop security. In fact, as noted in the performance section of this report, such fears were not confirmed by our tests.

CAMSHAFT, CAM FOLLOWERS & BEARINGS. Among the modifications incorporated in the Mk.II model are changes to the cam profiles. Large diameter flat mushroom type cam followers are used in conjunction with small

Cylinder heads showing valve parts and bathtub combustion chamber. Heads are screwed onto cylinder barrels with special buttress thread.

Oil pump disassembled to show plunger and two ball check valves.

Inside (top) and outside views of backplate showing twin Hall Effect ignition sensor assembly.

nose-radius convex-flanked cams to give a rapid initial valve lift and less abrupt deceleration as the valve approaches its maximum lift.

Each of the two cam lobes is 10.4 mm wide and has a (measured) lift of 3.18 mm. The four mushroom cam followers, two to each cam, are offset so that the cam action also rotates them to evenly distribute wear. The cam followers are some 11.4 mm diameter with 4 mm diameter stems which operate in bronze bushed guides that are an integral part of the crankcase casting.

In addition to the two cam lobes, the camshaft carries a third cam in the form of a 12.5 mm diameter eccentric which operates the oil pump. The camshaft is supported at each end by an 8x19x6 mm ball bearing.

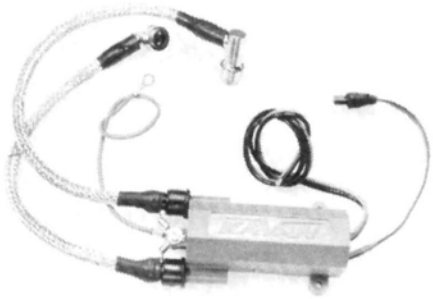
TIMING GEARS. When the camshaft of a pushrod OHV engine is placed below or alongside the crankshaft and is geared to it with spur gears, the designer is faced (because of the substantial separation of the two shaft axes) with a choice of either two rather large diameter gears, or of using smaller gears and bridging the gap with an idler gear.

The KF-50's designer opted for the latter course. The crankshaft pinion has 20 teeth and is fitted to the rear end of the crankshaft where it is pinned against rotation and secured with a single screw. The 40-tooth timing wheel is secured to the camshaft with a Woodruff key and a nut and washer. The intermediate gear—having, of course, the same number of teeth as the crankshaft pinion—is fitted with a caged needle-roller bearing and rotates on a 4 mm diameter hardened steel pin. In earlier engines, the idler gear was of nylon, but in the current models all three gears are of hardened steel.

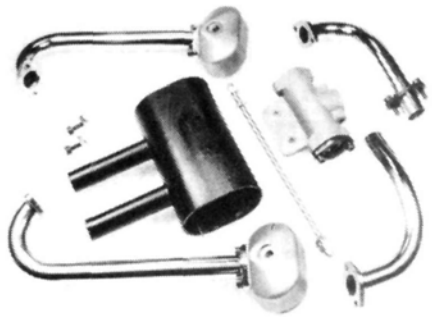
CYLINDERS. The cylinder barrels, each with six cooling fins, are machine finished from investment castings in nitriding steel. They are spigoted into the crankcase and located by a base flange, "full-size" fashion. The flange has a 40 mm o.d., is 2.6 mm deep and is recessed 2.5 mm into the case. The case is fitted with six 3.5 mm studs and each barrel is secured by means of a split hexagonal flange and six stop nuts.

This method of assembly, allowing the barrels to be rotated to the required position before being locked in place, is necessary to enable the cylinder heads to be properly aligned, since the heads are screwed onto the barrels—again a "full-size" procedure. The barrels are externally threaded above the cooling fins for this purpose and a buttress type thread is used for greater security and reduced risk of distortion. (In a buttress thread, the conventional "V" thread cross-section is replaced by one having an "N" section, thereby providing a vertical face that is better suited to transmitting pressure axially.)

CYLINDER HEADS. The liberally finned cylinder-heads are of investment cast aluminum and a concession to normal model four-stroke practice is seen in the use of bronze cup type combined valve seats and guides. Valve throats are 12 mm diameter and ports are 10 mm, widening to a nominal 11 mm diameter at the inlet and exhaust pipe connections. Valves are set vertically in the head, side by side, and the combustion chamber is a bathtub pattern, 4 mm deep, with the spark plug entering at a 45 degree angle from above without offset toward either valve position. This, plus the fact that the inlet and exhaust ports are the same size and set at the same 45 degree angle, means that the heads are interchangeable and the same part can therefore be used for either cylinder.



Ignition parts showing coil sealed in plastic case with IC components, screened HT leads and special spark-plug connectors.



Inlet and exhaust pipes, muffler parts, and heated inlet manifold.

PISTON & CONNECTING-ROD ASSEMBLIES. Yet another full-size connection, the FK-50's forged aluminum pistons are made by Mahle, the noted German piston specialists. As befits a four-cycle engine in which lubricant is supplied to the cylinder walls from below, each piston is equipped with an oil scraper ring, below the single compression ring, to prevent an excessive amount of oil reaching the combustion chamber. Until recently, the FK-50 pistons used a conventional compression ring, but the Mk.II models now have Dykes type (L-section) compression rings. At the same time, oil return holes, absent from the Mk.I, have been added, three each side, to drain excess lubricant through the piston skirt.

With pistons of conventional design, having orthodox wristpin bosses, heat flow from the piston head causes the skirt diameter to distort to an elliptical shape with its major axis parallel to the wristpin. To counteract this, it is common practice, with full-size engines, to turn or grind the piston skirt to an elliptical shape having its major axis at right-angles to the wristpin. The FK-50 has this refinement. The pistons have a nominal head diameter of 33.94 mm, giving a 0.03 mm (0.0012 in.) clearance between the top land and the wall of the 34.0 mm cylinder bore, but are tapered, top to bottom, to an elliptical shape so that the minor axis of the ellipse is reduced to 33.64 mm at the bottom of the skirt.

The FK-50 pistons are 26 mm long and are equipped with 8 mm o.d. full-floating tubular wristpins located by wire snap-rings. Complete with rings and wristpins, the pistons weigh 35 grams each. The forged high-duty alloy connecting-rods have tapered I-beam section shanks and, of course, have detachable bearing caps at the lower end to permit them to be fitted to the crankpins, the caps being secured with 3 mm socket head cap screws. As with other model engine conrods having split lower ends, the shell bearings common to modern full-sized rods are omitted and the FK-50 also omits the usual bronze bushes at the top end. Most conrod alloys are, in fact, quite good bearing materials and an ample supply of lubricant to the bearing surfaces is assured by the three oil holes at the crankpin end and two holes at the wristpin end. The rods are fairly long at 54.5 mm (1.95 x stroke) between centers.

VALVE GEAR. The valves have 13 mm diameter heads, 3.5 mm diameter stems and are 35.2 mm long. The valve

springs are secured to the stems by horseshoe retainers recessed into steel valve caps. Conventional investment cast steel rocker-arms are used. Measured rocker ratio on the test engine was approximately 1.13:1. Valve lift was thereby increased to approximately 3.6 mm from the 3.18 mm lift at the camshaft. The rockers have the usual screw adjusters for setting valve clearances. The steel pushrods connecting the cam followers to the valve rockers are 2.2 mm diameter and are enclosed in 6 mm o.d. aluminum tube covers.

VALVE TIMING. Measurement of the test engine, with valve clearances set at the practical minimum, yielded the following valve timing: inlet opens 35 degrees BTDC, inlet closes 75 degrees ABDC; exhaust opens 75 degrees BBDC, exhaust closes 35 degrees ATDC; inlet period 290 degrees, exhaust period 295 degrees, overlap 70 degrees. It will be observed that valve timing is the same for both inlet and exhaust, as are the valve and port sizes.

OIL PUMP. This, located in the oil pan, is of a simple plunger type. It has a cast bronze body containing a spring-loaded steel plunger that is operated by the eccentric on the rear of the camshaft previously mentioned. With upward movement of the plunger, a ball check valve in the bottom of the pump is opened and lubricant is drawn into the pump cylinder. As the plunger is depressed again by the cam, the inlet check valve closes and a similar one-way valve is opened at the side causing the oil to be forced up a brass delivery pipe to be discharged over the whirling crankshaft and thereby splashed around all the adjacent bearings, cams, etc.

CARBURETOR. Basically, the special carburetor fitted to the FK-50 is of the barrel throttle type with adjustable automatic fuel metering and an airbleed for fine-tuning the idle mixture. Mechanically, however, the way in which the mid-range mixture strength is automatically controlled and manually adjusted, is rather different from other carburetors of this basic type.

Essentially, mixture strength is set, in the first instance, via a spraybar and needle-valve, but no secondary needle-valve is used, nor does the throttle barrel employ a helical movement to reduce fuel flow at reduced throttle settings. Instead, the spraybar itself moves axially within the throttle barrel when the latter

(Continued on page 117)

Basics of R/C Helicopters

by DR. DAVID TROST

HELICOPTERS are undoubtedly one of the most perfect forms of aircraft. Until recently they were the only form of heavier-than-air machines that could hover in a stationary position. Shortly after full-size helicopters were introduced, modelers created working miniatures.

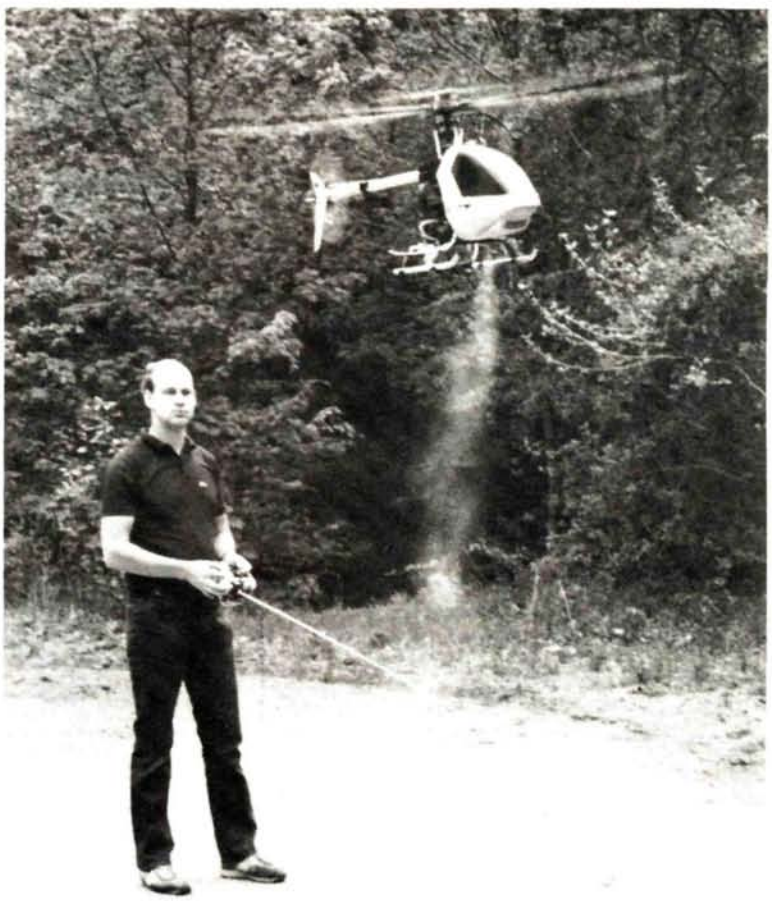
Development of radio-controlled model helicopters began in the early 1960s. It took many years of designing and testing before a really successful machine was produced. The current state-of-the-art model helicopters not only have the capabilities of their full-size counterparts, but greatly surpass them in their aerobatic abilities.

This article is the first in a short series aimed at the modeler who is just starting out in the exciting field of model helicopters or who is just interested in learning more about them.

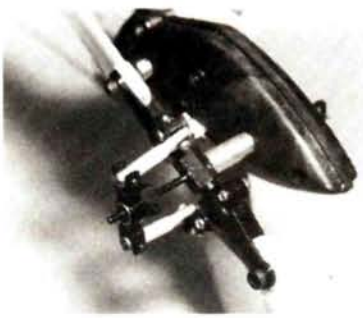
This first installment will deal with explaining basic R/C helicopter components and some of the requirements for entering the hobby.

Modelers have been trying to perfect the R/C helicopter through about two decades of development and constant refinement. Most of the initial work was undertaken by only a few very ambitious pioneers who would not let constant adversity prevent them from realizing their goal, flying a model helicopter. Today's machines are the product of their successes and their many failures. The "would-be" helicopter pilot of today only has to learn to assemble and fly his helicopter, while the pilot of the late 60s and early 70s had to design and construct his machine from scratch and then learn to fly it, all the while never really knowing if it *could* fly.

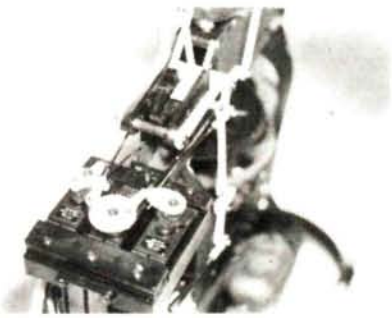
The modern model helicopter can be broken down into several major systems: the main and tail rotors, the engine and transmission, and the radio control system.



Helicopter flight takes much concentration, but once you've mastered the fundamentals, it's a breeze. Our test helicopter was the new Hirobo Shuttle 28 from Gorham Model Products. The Shuttle is a tremendous flyer and comes ready-built out of the box.



Typical tail rotor pitch mechanism.



Servo tray with linkages for cyclic controls and tail rotor.

Your indoctrination into the world of big blade flight.

Left: Our fearless helicopter fanatic, Dr. Trost, demonstrates starting procedure of his Shuttle helicopter. Note the rotor head is firmly grasped during starting. Right: The Hirobo Shuttle in action. Note helicopter training gear.

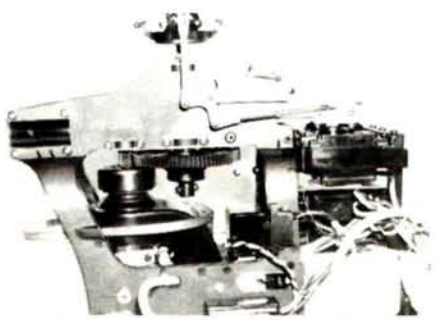
The most complex system and really the heart of an R/C helicopter is the main rotor system. The standard flybar rotor head, which will be discussed here, has two blades. There are "scale" flybarless heads with 2, 3, 4, 5, or even 6 blades available but their characteristics are beyond the scope of this article.

The main rotor system consists of a center hub, rotor blades, flybar, swashplate, and various interconnecting linkages. There are two basic types of rotor heads: the fixed pitch and the collective pitch. The fixed pitch head, as the name implies, has a blade angle of attack which is fixed at a predetermined setting usually around +3° to 4°. With this head, vertical thrust is dependent on the rotor speed.

In a collective pitch head the rotor blade pitch can be varied usually from about -2° to +7°, making vertical thrust dependent on both rotor speed and pitch. In actual use the goal is to keep rotor speed constant by increasing or decreasing the throttle as the blade pitch is varied.

ATS	Automatic Tail Rotor System. This electronic mixer on a "helicopter" radio transmitter automatically varies the tail rotor pitch to counteract the engine torque at different power settings.
Autorotation	Equivalent to a "dead stick" landing for an airplane.
Bell-Hiller	A combination of Bell and Hiller rotor control systems.
Mixing	In this system the main rotor blade pitch is controlled both directly by the servo and indirectly through the flybar.
Blade Tracking	A procedure used to determine that both rotor blades are producing the same amount of lift.
Collective Pitch	Refers to a rotor head which can vary the pitch of the main rotor blades making vertical thrust dependent on rotor speed and pitch.
Fixed Pitch	Refers to fixed main rotor blade incidence making vertical thrust solely dependent on rotor speed.
Flybar or Stabilizer Bar	Part of the rotor head which serves to stabilize the rotor blades. It also serves as a directional control mechanism transmitting control inputs to the rotor blades.

photos by LOUIS V. DeFRANCESCO JR.



Side view of Shuttle, which shows the drive train, starting belt, and gyroscope. The sensor is in front of the engine and the amplifier is below the radio switch.

A typical collective pitch rotor head, which incorporates Bell-Hiller mixing and a sliding swashplate collective system.

Another view of the collective pitch rotor head. See text.

Fixed pitch rotor heads are much simpler than collective heads so they're much cheaper to produce. They have fewer moving parts and are easier to maintain. Their disadvantage is that they don't allow the same fine control offered in collective pitch machines. Vertical control isn't as quick in a fixed pitch machine because with each throttle input change, the whole rotor head must accelerate to climb or decelerate to sink. This works quickly in a small .28-size machine but the lag in control response becomes quite long in .60-size models. The collective pitch head has ball-bearing-supported blade holders mounted on an axle or axles. The axle/axles are not rigidly fixed to the main rotor hub so the blades can flex under loads. Manufacturers use rubber in the axle suspension system to dampen out unwanted vibration. Each blade holder has a pitch control arm.

The rotor head is also fitted with a flybar. A flybar is a rod with paddles at each end. These paddles look like short sections of a symmetrical rotor blade. The flybar is orientated perpendicularly to the main blades and is mounted so that it can pivot up and down at its center and also rotate on its axis. (In fixed pitch heads the flybar is firmly mounted to the blade holders, but it can still pivot on its long axis. The whole blade holder is mounted so it can pivot on the main shaft.) The flybar acts both as a stabilizing system by gyroscopically trying to keep the main blades at equal pitches, and also as a directional control system which will be discussed later on.

The rotor blades are constructed of hardwood or a hardwood and balsa laminate. They can have either a semi-symmetrical or symmetrical airfoil.

This brings us to the rotor head control system. The heart of the control system is the swashplate, which transmits control inputs from the stationary fuselage to the moving rotor head and consists of two disks studded with ball links, connected together by a captured ball bearing. The inner/upper disk rotates with the main shaft and is supported on a ball so that the swashplate can pivot about 35° in relation to the main shaft. The outer/lower disk of the swashplate is fixed to the main chassis. The swashplate is connected to the fore/aft (elevator), right/left (aileron) cyclic control servos through bellcranks and pushrods.

There are two basic mechanisms by which the cyclic control commands are transmitted to the rotor blades, the Hiller system or the Bell-Hiller system.

Our test radio was the Circus Century 7 from Circus Hobbies, designed specifically for helicopter use. A helicopter radio makes flying much simpler.

In the Hiller control system there's a direct connection between the swashplate and the flybar pitch control arm. The flybar holder is then attached to the main blade pitch controls. In this system a control input from the servo will tilt the swashplate, be transmitted to the flybar, which will twist giving one of its paddles positive incidence and the other negative incidence. Due to the positive and negative lift on the paddles, the flybar will pivot and change the pitches of the main rotor blades—one up and one down.

(Continued on page 112)

Ground Effect	The effect of the ground on the column of air lifting the helicopter within about 1 rotor diameter above the ground.
Gyroscope	A mechanical and electronic device mounted in the helicopter which senses movement around the yaw axis and automatically applies tail rotor input to counteract this unwanted movement.
Helicopter Radio	A radio control which has specialized mixing functions for helicopter use, usually ATS, adjustable pitch curve, high idle, and throttle hold.
High Idle	A selectable throttle low end-point adjustment. Usually set so that flying rotor speed maintained when rotor pitch is all the way down. This function is useful in rolls and loops.
Hiller Mixing	A rotor blade control system which provides direct control to the flybar which drives the main blade pitch control.
Pitch Curve	The relationship between the engine power to the main rotor pitch.
Rotor Disk	The area swept out by the main rotor blades in one revolution.
Swashplate	A device which consists of 2 rings connected with a ball bearing race suspended on a ball. This device allows transmission of control inputs from the stationary fuselage to the moving rotor head.
Throttle Hold	A selectable switch which uncouples the throttle channel from the left stick and holds it at a predetermined setting allowing the collective pitch to be controlled independently of the throttle, usually for autorotations.
Training Gear	A flight training device, usually consisting of two long dowels with plastic balls on the ends crisscrossed and rubber-banded to the helicopter landing skids. This enlarges the machine's footprint, preventing tipovers and damage.
Training Stand	A flight training device which tethers the helicopter to the ground and provides only limited movement of the machine on all flight axes, preventing the possibility of damage.

GIANT STEPS

(Continued from page 81)

with gusty winds being driven every which way by the mountainous terrain. Two helicopters had been scheduled to participate, but were withdrawn at the last moment and their "payload" was distributed among the fixed-wing models.

The pilots were Peter Cary (flying a Taylorcraft), Bruce Bender (Big Rainbow), Ken Huff (Kouba Stick), Alex Svatos (Sig 1/5-scale J-3), Ron Passmore (Senior Telemaster), Brad Billings (Modified Sig Kadet, Mk II), and Deryl Kartz (Telemaster 40). Our congratulations to those involved in this rather unusual endeavor.

Dick Phillips, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Glideline Publishing, 228 Windsor Dr., San Carlos, CA 94070.

Pelican Enterprises, 265 Oxford Lane, Bloomingdale, IN 60108. ■

JET BLAST

(Continued from page 57)

the Dallas/Fort Worth area on September 21 and 22. Dawn Buckley* is handling the coordinating chores and has all the info you'll need.

For peak performance, stay tuned!

Rich Uravitch, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies and people mentioned in this article:*

Jet Model Products, 304 Silvertop, Raymore, MO 64083.

Tom Sewell, 4183 Travis Mountain Circle, Austin, TX 78758.

Jet Hangar Hobbies (JHH), 12554 Centralia, Lakewood, CA 90715.

Video Specialties Inc., P.O. Box 4557, Monroe, LA 71203.

Kress Jets, Inc., 27 Mill Rd., Lloyd Harbor, NY 11743.

Stan Brown, 1320 S. 359th, Federal Way, WA 98003.

Dawn Buckley, 513 Chickasaw, Grand Prairie, TX 75051; 800-527-1630. ■

PATTERN MATTERS

(Continued from page 79)

the fire in the last round of competition.

Another thing to watch on plugs is the element. This is the very heart of a glowplug, and there's a difference in plug elements from brand to brand. You want a plug which has as thick an element as possible. A thick element will not only last longer, but it retains heat longer to ensure continuous combustion.

The style of plug you use is also important. Obviously, there's either the idle bar type or the standard type. I personally use and recommend a standard type plug without the idle bar for two reasons.

First, the idle bar was invented to prevent raw fuel from entering the combustion chamber and putting out the fire. In theory, this sounds great, but if there's that much raw fuel floating around inside the combustion chamber, whether at idle or not, the engine probably isn't going to run anyway. There's just too much fuel! However, if the engine is properly tuned, you won't have raw droplets of fuel floating around. You'll have the ideal mixture of fuel, which is a

(Continued on page 58)

Available from Tower Hobbies

Majestic Major

by JIM WOODSIDE

A classic Old Timer free flight with R/C assist.

AS A young schoolboy in the immediate post-war years of austerity England, I used to gaze in wonder and not a little envy at the photographs in *Aero Modeller* of the grown men able to build the large free-flight cabin models powered by almost unobtainable American petrol engines. Because of the relatively lower incomes over here, British kit models opted for more conservative sizes of about 3- to 4-foot wingspans, which sold for the equivalent of $3 or $4.

While modelers in the U.S. were busily converting from ignition to the glowplug, the 2cc diesel engine was becoming the rage in Europe. So our differences persisted until the recent resurgence of the vintage movement. The level of interest has now made it commercially viable for kit manufacturers to introduce (or in some cases reintroduce) models from yesteryear. The largest range in England comes from Ben Buckle Kits; a range which includes the famous Ben Shereshaw Cloud Cruiser, known in England as the Falcon, and the Majestic Major, which is the subject of this review.

The Majestic Major, distributed in the U.S. by Tower Hobbies*, is a 1.5 times enlargement of an original Keil-Kraft model called the Junior 60, dating from 1948. The result is an 88-inch span model suitable for 10cc motors which is easy to build and pleasing to look at. So after forty years the tide across the Atlantic has changed direction and now you American modelers can buy British! The difference is that in 1986 it won't damage your billfold.

Strangely, the rise in old-time models hasn't been paralleled by the large scale remaking of original motors, although you vintage fans will probably be aware of the British-made Orwick Replicas from the Dunham Engineering workshop and available in the U.S. from Striegler R/C. The chief choice of powerplant has been the modern-day four-stroke, usually of Japanese origin.

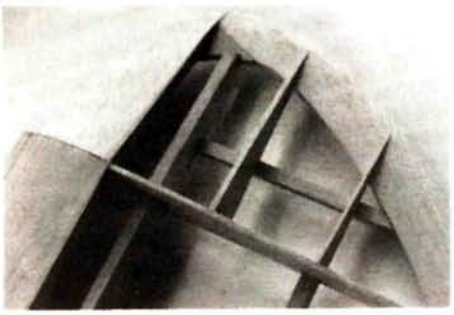
As fine as these products are, it has proved to be very satisfying to be able to use the homemade Laser, which is among the best in the world. However, it's only possible to buy the superb Laser four-stroke directly from the manufacturer, AGC Sales*, here in the U.K. Believe me, it's well worth the effort of obtaining a money order to get an engine computer-machined from bar stock and which is capable of delivering high power on a straight mix of methanol and castor oil. The complete range consists of .45, .61, .75, and .90 singles and a 1.20 vee-twin. The .61 has enough power at half-throttle to urge the Major into the air, while quarter-throttle will cruise it around the sky. By the way, the .75 is a popular choice for scale models because it has excellent power at 5,000 rpm and, hence, scale-like speeds are possible.

I hope by now to have whetted your appetite enough to try this "Limey special."

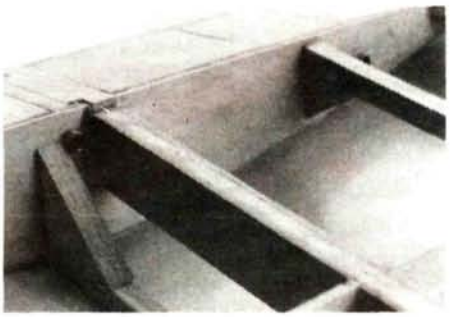
THE KIT. In the box you'll find two dye-line plans; one for flying surfaces and the other for the fuselage. The wing ribs come as band-sawn block, all neatly cut, as are the main ply formers. Most important, though, the kit comes complete with all that's necessary to make the model, except for wheels, covering, and glue.

CONSTRUCTION. At the outset, check the size of your building

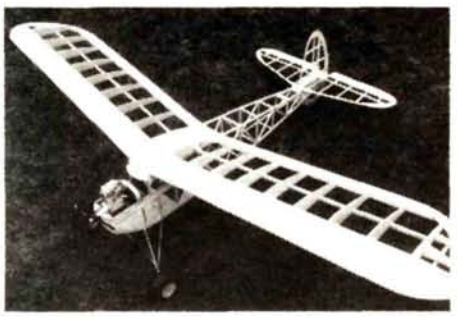
Ben Buckle's Majestic Major is a graceful model that also makes for an excellent trainer.



Wing tips are easily formed from die-cut parts.



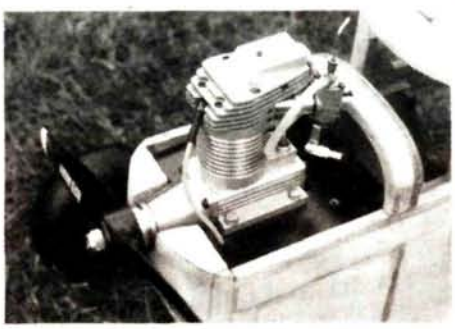
Underside view of wing center section shows plugs for dihedral brace.



Uncovered model brings back shades of the 1930s.

board to make sure it will accommodate the fuselage, which is 5 feet long, and the assembly of the wing halves (7 feet, 6 inches long). I must admit that, for this operation, I had to migrate from the workshop to the kitchen table and also enlist the help of my wife. Apart from the size, construction is very straightforward and takes no longer than any similar model of lesser size. What becomes apparent is that you can affect your overall costs by the glue you choose. Quick-set epoxy and white glue do a fine job. The use of cyanoacrylate will speed up the construction, but will probably double your expenditure in this department. I chose the latter option.

The wings are built of split construction joined by three wire dowels. Each panel is constructed around a substantial spar of 1¼x¼ inches. These are scarf-jointed at the outer end. The inner portion is faced with 1/16-inch ply to lend strength in the most stressed area. Once this is done, basic rib and spar construction can be done in a couple of hours. When fitting the wing tips I chose to add some extra pieces to better support the covering material.



The addition of a four-cycle engine gives magic to the Majestic Major.

Take your time in carefully assembling the center section, as it controls the truth of the whole wing's construction. The unit comprises four ⅛-inch ply ribs and three tube-rod connectors. Dry-assemble the parts and check for accurate mating along the centerline join. If you're happy with it, trim the tubes to length.

Polish the tubes to brighten them and clean them with a solvent. This simple process greatly improves the metal-epoxy joint. Box-in the tubes between 1/16-inch ply plates, filling the void with balsa and epoxy. Now the wing panel can be offered up to the center section. Check that dihedral *and* wing incidence are correct in relation to the center. If they're okay, spot-glue the panel to the main spar and make sure all other joints are good.

Leaving the sub-spars slightly long will enable you to angle their ends to form clean, flush butt joints to the ply rib. Although not shown on the plan, I added some triangular gussets to lend extra support to the sub-spars. Repeat the same process on the second panel, but make sure that all rigging angles are identical to the first panel. An extra pair of hands is a great help at this stage.

(Continued on page 77)

ONE 8TH Air Force Scale Fly In

Bill Mikesell's SB2C Helldiver. See text.

FRIDAY, MARCH 21, 1986, dawned clear, cool, and dead calm in Phoenix, Arizona; a great day for the unofficial start of the ⅛th Air Force Spring Scale Fly-In. There are always many magnificent scale planes at this gathering, but I've always been impressed by the outstanding flying that goes on.

Arriving at the field Friday morning, I was treated to the sight of a big Platt Me 109 diving down in a huge sweeping turn, then leveling off at about 3 feet and screaming full-length down the far edge of the 600-foot, newly-paved runway. Hot on his tail was a big Baker P-47 that made an identical pass at about 2 feet. The smooth, curving pull-ups after these long, low passes were beautiful. This is how Denny DeWeese, flying the Me 109, and Diego Lopez, flying the P-47, unofficially opened the fly-in. On the next pass, I think they were even lower!

Deciding to give support to Diego, Brian O'Meara blasted his big Baker P-47 down the runway and pulled up into a climbing turn set to intercept the Me 109. Denny, however, decided two P-47s were too much, so he pulled the plug and landed his 109. Brian then commenced to put on a good show and had his Jug really humming—Denver would be proud of you, Brian.

Before I had a chance to see Jerry Kitchin and his dad, Olie, their beautiful Byron Staggerwing lifted off. The flight that followed had to be seen to be believed. Long, smooth slow rolls, four- and eight-point rolls, a knife-edge the full length of the runway, and huge, round loops with a graceful roll at the top. His rolls and knife-edges are usually done just a few feet above the runway. Before the fly-in was over Jerry also had flown two Byron P-51s, a CAP 21, and a Zlin, all of which are beautiful planes made by Frank Grey, Jerry Pitzel, and Jerry and his dad. The younger Kitchin emulates Ted White's airshow style of flying and is now close to the Master.

Before taking my deHavilland Hornet out of the car for some fun flying, I wandered up and down the pit area greeting old friends. Bob Mosher and Bill Roberts, all the way from Del Rio, Texas, had their small Fokker D-7s chasing each other all over the sky.

Every year more modelers come in their motor homes, campers, and trailers to this event, and stay right at the field. There were a bunch more this year and the AMPS graciously offered their superb new field to the ⅛th for the fly-in. And what a field! A new 600x75-foot black-top runway with long, smooth dirt over-runs and a smooth wide area alongside the runway. Top this off with no flight obstructions, a large ramada,

Above: Frank Gray and Jerry Pitzel's Dago Red Reno Racer. Right: Impressive array of airplanes of all sizes and descriptions.

Above: Immaculately detailed deHavilland Moth of museum quality.

by DAN PARSONS

color photos by GLENN OVERLANDER

and no houses within a couple of miles, and you have as fine an R/C field as there is in the country. Many thanks, AMPS members!

But back to the flying, Jim Malek asked Jerry Kitchin to test-fly his beautiful new Byron Staggerwing because of Jerry's extensive experience with his own Byron Staggerwing. After a perfect takeoff and a trim pass, Jerry put that Staggerwing through a fine workout. It looked like he was flying his own; the big Saito 270 four-cycle twin did a good job, but didn't give the vertical performance of the Q50 in Jerry's Staggerwing.

Unfortunately, Jim lost his Staggerwing the next day on its second flight due to a bad cell in his transmitter pack.

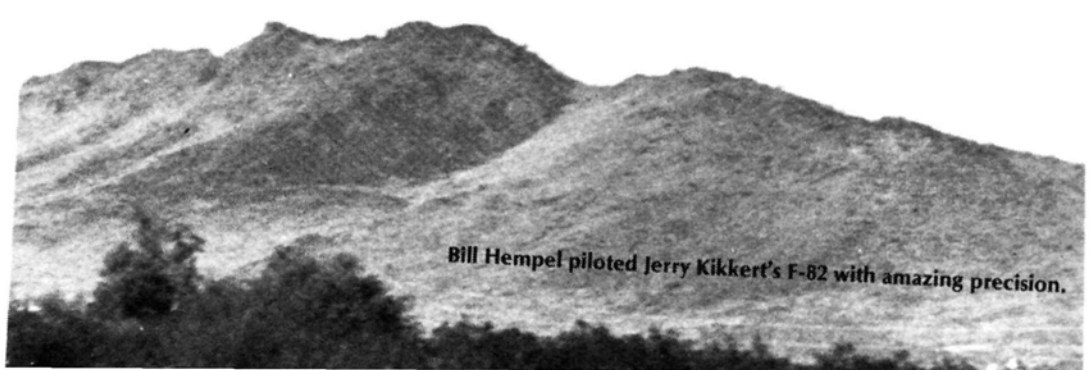
I finally got around to putting my Hornet twin together and checking it out. I had test-flown the Hornet three years ago at this meet, so this was some sort of anniversary flight. To my delight, the takeoff run was straight. Pulling up the gear soon after the wheels left the runway, I commenced having a grand time with low passes, long slow four-point rolls, and big loops.

A new and really different plane needing that first test flight was Bill Mikesell's gorgeous 75-inch, 15-pound O.S. 108-powered SB2C Curtiss Helldiver that he scratch-built. Bill asked Bob Frey to do the honors. Bob is not only an experienced and fine flier, but he's especially skilled in any kind of emergency situation. Right after a good takeoff run, he needed that skill. Excessive up trim combined with a vicious left turn kept Bob very busy for about 10 seconds until he could get all the opposite trim cranked in. Once he got it within reasonable trim, Bob showed the plane's very solid and smooth flying capabilities.

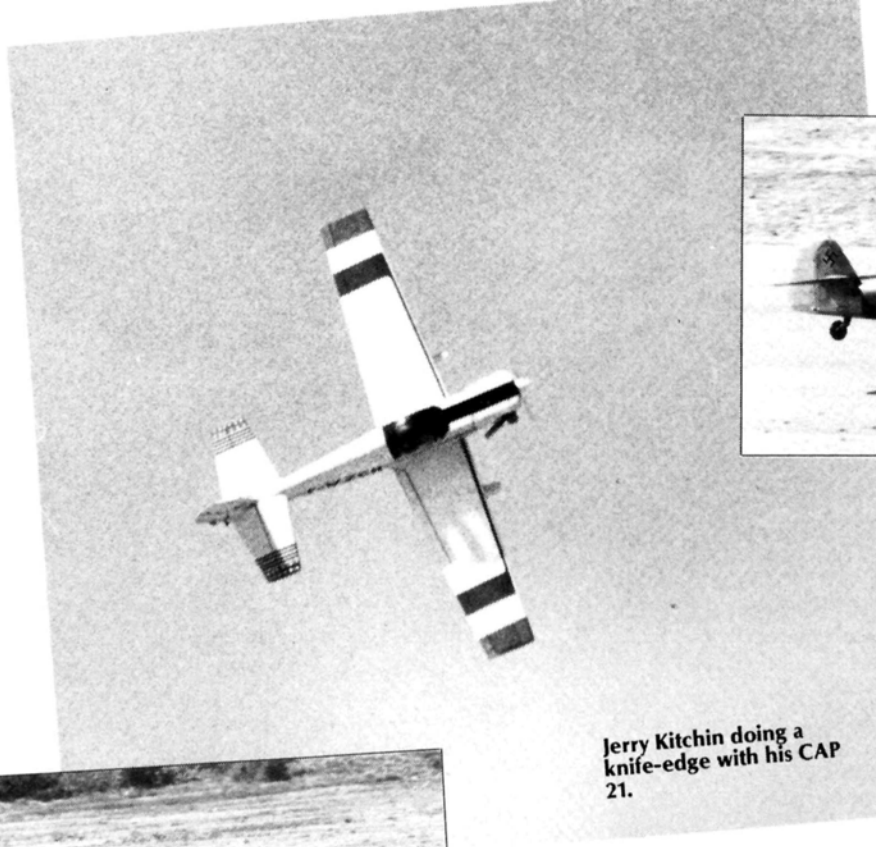
Though certainly not a new or unusual type in R/C, Jerry Ortega's scratch-designed P-47, in glorious primer grey, was interesting in its "mid-range" 73-inch wingspan. Weighing only 13 pounds and Webra 90-powered, it had an excellent performance according to Bob Frey who took a turn on the sticks and put the Jug through

Jerry Kitchin's nicely-detailed P-51 made hair-raising low passes.

Lewie Kear doing it the hard way. See text.

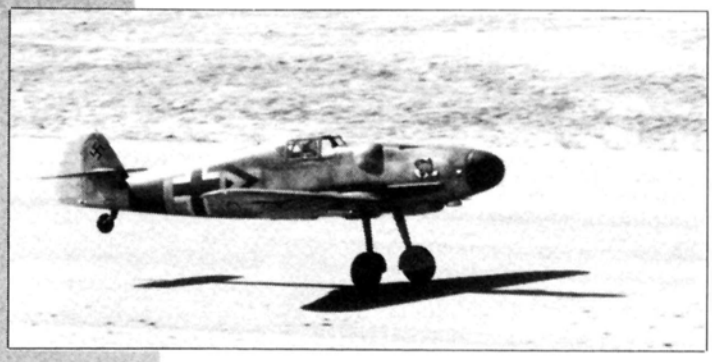


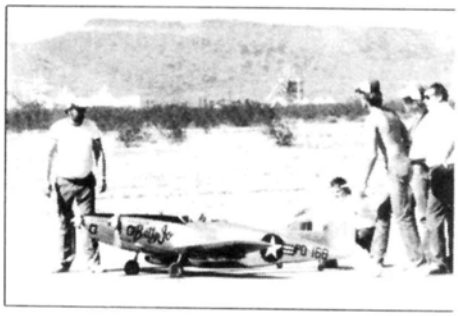
Bill Hempel piloted Jerry Kikkert's F-82 with amazing precision.

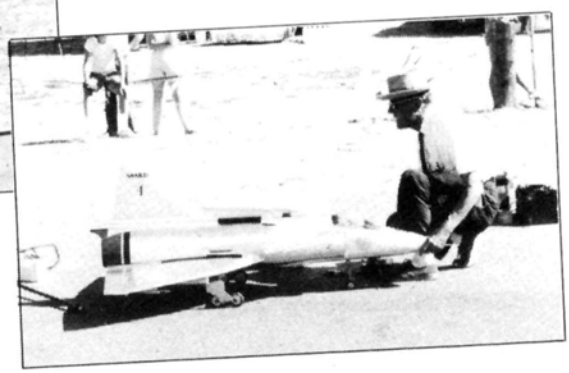


Jerry Kitchin doing a knife-edge with his CAP 21.

Denny DeWeese flew his Me 109 as it should be flown—realistically.







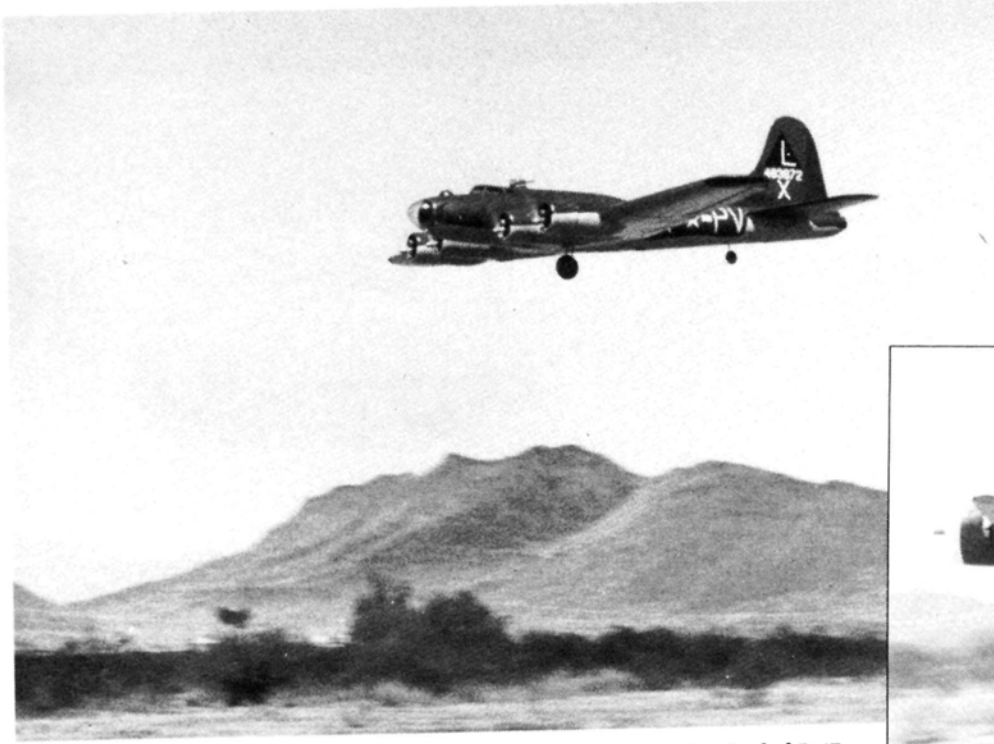
Above: Diego Lopez's big P-47 puts out its legs. Right: Col. Bob Thacker brought his immaculate Saab AJ-37.

its paces.

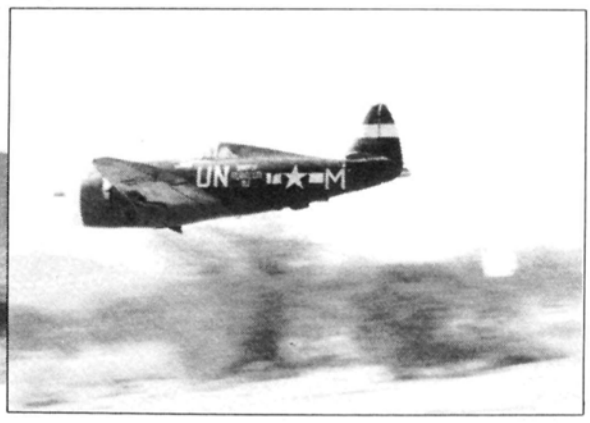
Saturday dawned and, like Friday, it was perfect flying weather. Most of the rest of the fliers arrived, with the total by Sunday reaching 133 registered pilots who brought over 170 scale planes.

While standing in the registration line I heard a familiar voice giving me a bad

Jess Wright's big Laser on takeoff.



Shades of "Twelve O'Clock High," Tony Arand's crippled B-17 on an emergency landing.



Brian O'Meara with his big P-47 down among the bushes.

Above: Jerry Kitchin's Byron Staggerwing on lift-off. Left: Ground crew prepares a big F-82 for flight.

Jerry Kitchin's beautiful Zlin about to touch down.

Bob Frey's MB-5 bearing down for a low pass.

time about something. The words were music to my ears because they came from Bob Thacker. He was there with his latest scratch-designed and different plane—a ducted-fan Saab AJ-37 Thunderbolt, weighing 13 pounds and pushed by a Rossi 81 and Byron fan unit.

That always-cheerful father-and-son team of John and Tony Arand had some problems with their two Blohm and Voss 141Bs, those weird asymmetrically-arranged planes.

(Continued on page 101)

Dennis Crook's TBM only lacked an aircraft carrier.

Above: Kitchin's P-51 is from Byron's kit. Below: Frey's MB-5 was extensively detailed.

Eldon Wilson's Wildcat is a rare sight to see.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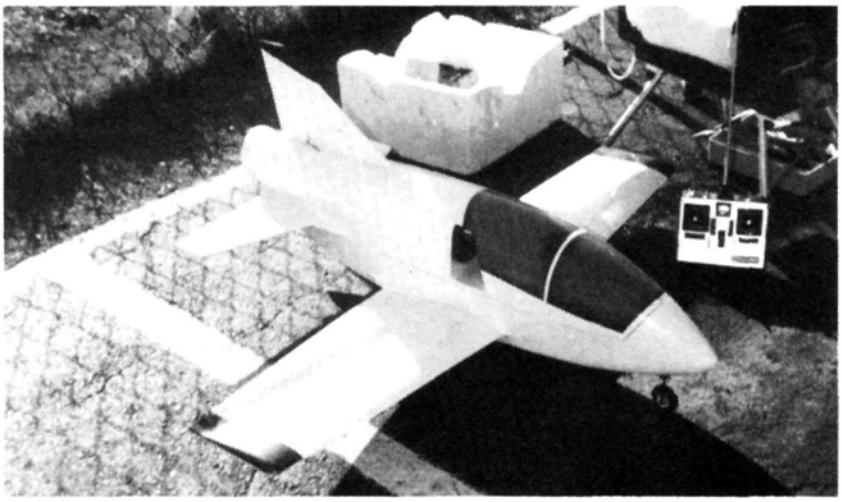
Jet Blast

by RICH URAVITCH

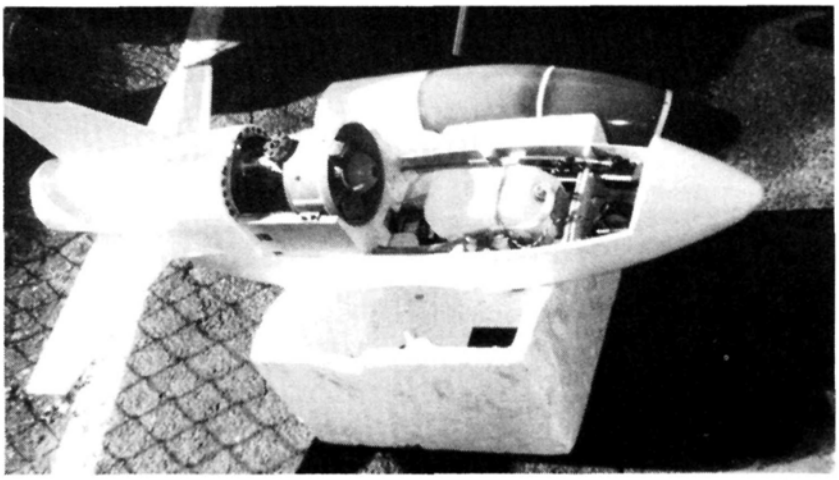
ONE OF THE GNATTY problems we fan guys experience is starting the engine. Since our fan units are nearly always buried within the structure, *how* we fire up is often dictated by the size of the hatch. On really tight installations with a minimum of space forward of the spinner, using a conventional starter in the spinner contact mode is impossible. Belt starting is okay, providing there is a knurled area on the spinner to accept the belt. Even *this* method becomes more difficult as engine displacement goes up, and that doesn't even consider the potential danger of a belt getting caught up in a fan.

The solution to the problem comes from Tom "Starfire" Cook who is now marketing his own offset starter through Jet Model Products*. The starter is built around a Sullivan Dynatron unit to which Tom adds a belt drive mechanism to make it all happen. I first saw the pre-production unit in action at the '85 Greater Southwest Fan-Fly and it worked well, especially on Tom Sewell's F-20 "rocket" which could only be started "through the cheater hole." Check with Jet Model Products for additional information.

On the other side of the starting procedure coin is Tom Sewell's* prototype BD-5J, which has got to be the ultimate in simplicity. It reportedly flies at about 80 mph, but is believed to be capable of more once a better inlet design is developed. As the photos show, once the hatch is removed, *everything* is accessible! A kit version of this airplane could become the standard ducted-fan trainer! The word I get is that Tom may offer a "semi-kit" package once he gets the inlet sorted out. My name is on the list, just as an experiment. Drop Tom a note and let him know if you're interested.



Tom Sewell's BD-5J has Kaos type wing, Turbax fan, and simple arrangement.



With cockpit cover removed, you have access to entire works.

JHH F-86

Dave Malchione of Kennett Square, Pennsylvania, is really enthusiastic about the JHH* F-86. He sent some photos of three of them. His plan is to fly an air show routine, probably along the lines of the Kissimee, Florida, based "Cloud Dancers." All three F-86s are finished in the scheme of the full-scale Japanese "Blue Impulse" demo team and use Rossi .65s. Two use Dynamax fans while

the third employs a Turbax III. Dave, his dad Tony, and his brother Pete are planning to fly demo shows in their area and should have it all together by the time you read this. Quoting Dave in his letter, "After building and flying ducted

Jet Model Products new offset starter makes firing up a snap.

fans for five years...I've finally found...the perfect trainer for the beginner." Not having flown one, I can't comment first-hand, but I will say that those I've seen fly seem to support Dave's opinion. Kenny Perkins expressed pretty much the same viewpoint when he reviewed the kit for *M.A.N.'s* June 1986 issue.

Video Info

A couple of months ago I mentioned that Chuck Daley of VSI* was working on a video tape which covered the Greater Southwest Fan-Fly, in 1984 at Segin, Texas, and in 1985 in Houston. The tape runs about two hours and is the end result of some 12 hours of footage. Among the "stars" are Tom Cook's F-4, Lynn McCauley's F-104 and A-10, Mike Kulczyk's Gloster Meteor, Tom Street's B-737, most of the Byron line, and lot's more. It's a mix of flight and static footage blended with interviews with the fliers explaining what it's all about. I haven't yet seen the final version, but Chuck tells me that those who have are really excited about the result. You can order your copy from VSI for $29.95 plus $2.50 for UPS shipping. Specify VHS or Beta format.

Performance Calculations

For you fan folks who also play with computers, Bob Kress* has developed a program which will enable you to do performance calculations. It's written in BASIC and can be supplied on cassette or disk. It was developed using the Radio Shack 100 computer, but Bob reports it to be equally usable on other PCs. It uses the BHP vs RPM data for the O.S. .46 as baseline, but any engine data can be input. The program also allows the user to input physical characteristics of any rotor design, including diameter and number/pitch/chord of the blades. Atmospheric data tables are provided so you guys who are flying high in Colorado can see just how much performance you'll need to recover to match us sea-level dwellers. There are lots of other neat features too. Bob is selling the program for $50; contact him directly.

The Malchione clan with their Jet Hangar Hobbies F-86s.

Lori and Cindy add their good looks to those of the Malchione F-86s.

Sundowner

I'll conclude this month's installment with a call for assistance I received from Stan Brown* of Federal Way, Washington. Stan is looking for a set of plans for Bob Violett's Sundowner which originally appeared in the July 1974 issue of *American Aircraft Modeler.* I remember the airplane as rather "F-4-ish" in appearance with a semi-submerged JHH Turbax unit for power. As I recall, Bob flew it with a K&B .40 SRII racing engine. It might be interesting to revisit that design right about now since we have come as far as we have. Can anybody help Stan (and maybe others) out?

Greater Southwest Fan-Fly

Finally, don't forget to plan on attending the 1986 4th Annual Greater Southwest Fan-Fly which will be held in

(Continued on page 42)

PATTERN MATTERS

(Continued from page 42)

vaporized gas.

The second reason for not using an idle bar plug is the fact that a lot of them aren't built to withstand the enormous rigors of a screaming pattern engine. Many plugs use an idle bar that is tack-welded in place. Most of the time these plugs hold up well, but if that weld fails, your engine just bought the farm.

Don't get me wrong. I'm not saying that there are garbage plugs on the market, but there are some that just can't take it when things get hot. If you insist on using an idle bar plug, make sure that the idle bar has a good, strong weld or is an integral part of the plug body, like the Fox* plug.

Speaking of brand-name plugs, there are a couple more plugs on the market to choose from. Bridi Aircraft Designs* now manufactures a plug designed specifically for the rigors of high-powered pattern engines. I've used them and they are quite satisfactory for pattern life in the fast lane.

Another plug just out is marketed by Full Command Systems and can be found at your local hobby shop. I've also used some of these plugs and found them real nice for pattern. Best of all, they have a significantly heavier element in the body.

'Til next time, we're on the pipe and airborne.

Mike Lee, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

AMS Imports, 1110 S. Wells Ave., Reno, NV 89502.

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616.

Airtronics, 11 Autry, Irvine, CA 92718.

Fox Mfg., Co., 5305 Towson Ave., Fort Smith, AR 72901.

Bridi Aircraft Designs, 23625 Pineforest La., Harbor City, CA 90710. ■

JAC-RABBIT

(Continued from page 73)

Next install the steering linkage. This step is a breeze because the steering linkage is assembled at the factory.

Mount the gigantic steering servo and the fuel tank. When fastening the servo to its mounts, be careful not to tighten it too much; it could distort the servo

(Continued on page 62)

Field & Bench Review

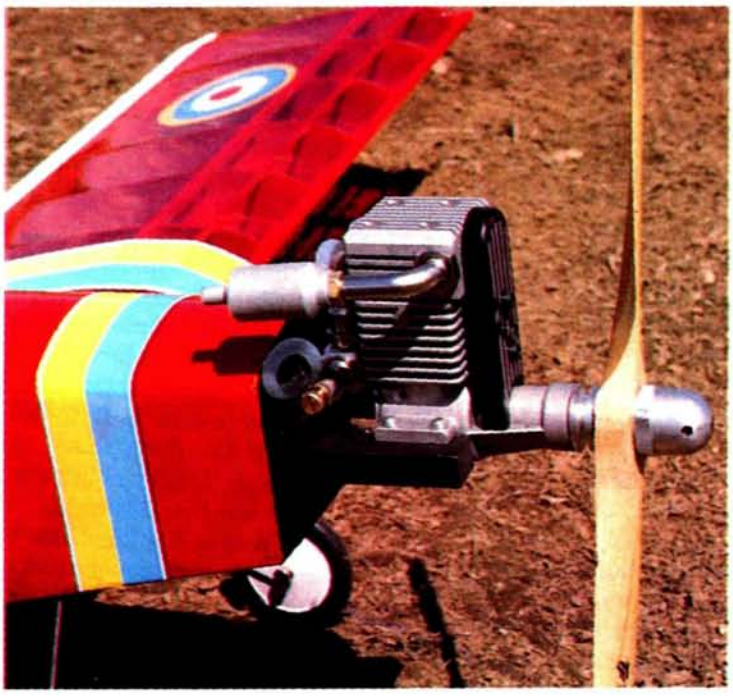
by CHRIS CHIANELLI

ONE OF the primary "quests" of the sport flier has always been the search for the fast-building kit. There have been, and are, many available, but unfortunately most are candidates for the slab-sided "Mr. Boxy" contest. The RPM 25L—and all the Barnstormer line distributed by Varicom Industries*—brings better looks with faster assembly. This is accomplished with the use of

RPM

Barnstormer

Type: Sport
Wingspan: 51 inches
Wing Area: 450 square inches
Weight: 3½ pounds
Engine: .20-.25 two-stroke
.35-.45 four-stroke



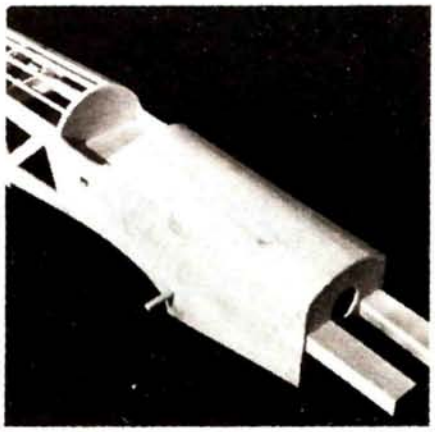
The Webra T4-40 is smooth yet powered the Barnstormer masterfully. This engine is now available exclusively from United Distributors.

interlocking notches on the fuselage sides, bottom, and formers. Notched leading and trailing edges on the wing, stab, and fin are also to be found. In other words, there are so many slots and keyways that the final product is not only arrived at with alacrity, but the chances of misalignment are greatly reduced.

I guess the Barnstormer series might be compared to an extremely simple jigsaw puzzle, the difference being that you know in advance where the pieces go, making it no "puzzle" at all. The open, antique look of the 25L leaves you with the impression that much more time was spent on the building board.

My 25L, with the aid of Zap glues from Pacer Tech*, was ready to go in four evenings and weighed 3½ pounds.

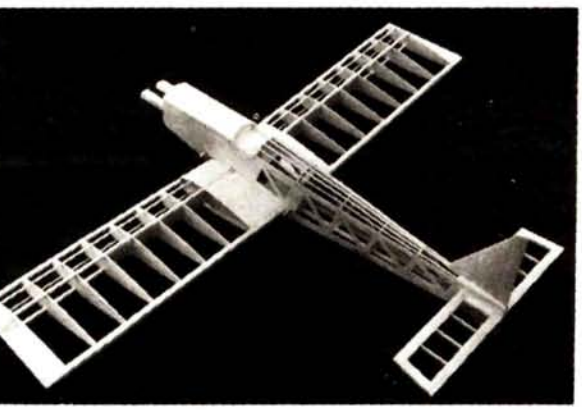
These models get their beauty, strength, and weight (or lack of it) from lite-ply fuselage sides and bottom that have all those open bays you see in the photos already cut out for you. The round top is formed by five spruce stringers. The wing, which is also utterly simple to build, with its prefab notches and all, has a time-proven feature, a turbulated airfoil. In between the leading edge and the spar is a sub-spar top and bottom, giving the airfoil a secondary high point or "bump" at this location. Models having this feature, and there have been many, display very good stability at low speeds and are the type that really "hangs in there." This gives the novice or the nervous modeler that all-important second chance. Incidentally, both Frank Tiano and I agree that our good friend Richard "Burt" Uravitch, who is a gifted builder but is often nervous on the sticks, should give this one a try.

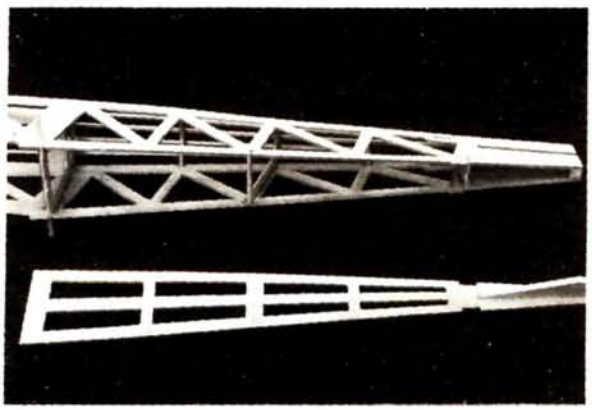


The only piece of hardware I didn't use from the kit was the aileron torque rods. I just felt more at home with the Du-Bro* rods.

The radio I used was Polk's Model-craft Hobbies* Hi-Tec Challenge 620 6-channel. Let me tell ya, when this radio came to me I was slightly shocked. I did

(Continued on page 82)





Assembly shots illustrate the extensive prefabrication provided.

JAC-RABBIT

(Continued from page 58)

housing.

I messed up the next step. When installing the batteries and battery case, I put them in backward and, I'll tell you, it's really disappointing when you think it's all ready to go and you turn on the switch and nothing happens. Just take the time to do it right.

Bolt the roll cage to the side of the chassis. This only takes a minute or two to complete and is a very important step in making the chassis a little stronger.

Now we're in the home stretch. Install the rear axles and shocks. Don't jump the gun on this step and install the shocks first; you'll just have to take them out to install the axles. I know this because I did it incorrectly myself. Mount the tires next. This is a matter of eight bolts in the back and two in the front.

Are you itching to run it yet? Just a minute, you need a radio. I used the new XL2P pistol grip from Airtronics*. The XL2P has a reversible handle for left-handed operation, a trigger-operated throttle with proportional brake, trim, end point adjustments, and servo reverse. Other functions include a multi-function "back" switch for reverse, pre-set throttle and/or brake operations, and a wheel type directional control with trim, variable dual rate, and servo reverse. For a more detailed report on this radio, see Charlie Kenney's review elsewhere in this issue.

Install the receiver according to the instructions. I recommend using a plastic bag or something similar to protect the receiver from moisture. It's in a very vulnerable spot and it gets very costly to keep replacing receivers. The car is just about done with the exception of the checks and adjustments following the radio installation. Once these steps are complete, get ready to have some serious fun!

PERFORMANCE. With a completion time of just an hour or so, it wasn't long before I was ready to do some stomping with the Jac-Rabbit. With the second pull, the powerful Zenoah engine came to life. After letting it warm up for a minute or so, it was time for the moment of truth!

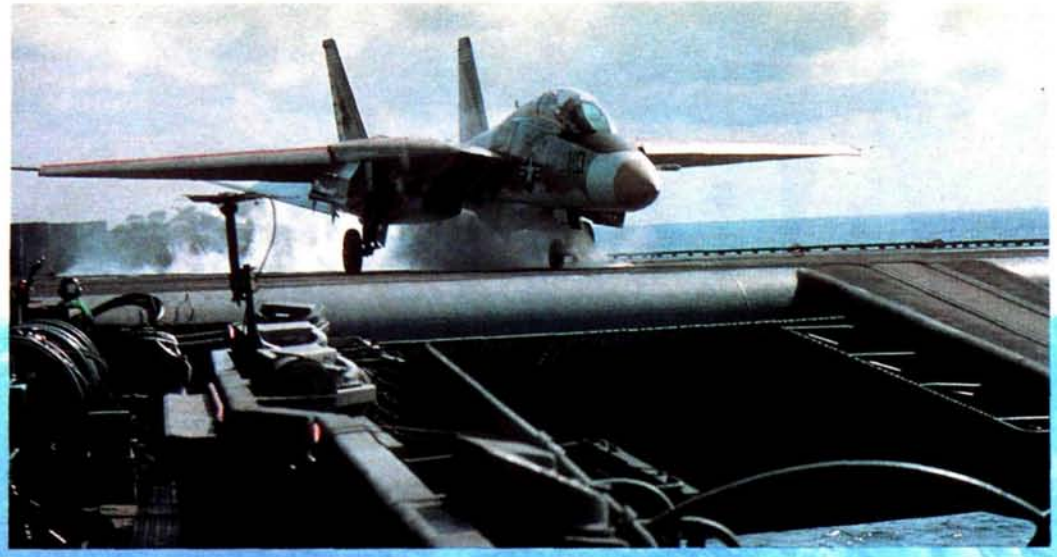
My friend Rick handed me the radio and I squeezed the throttle. Without hesitation the Jac-Rabbit jumped from its pavement perch and began its assault on the long stretch of sand. With a top speed of 40-plus mph, it wasn't long before the car had reached the end of the beach, leaving two long and deep trenches from its enormous rear tires.

Before making a return, I decided to build a quick jump to test the car's flying ability. At near open throttle it was difficult to hit the narrow jump on the first pass. I then circled around once more for another try. This time I hit it dead center and the Jac-Rabbit soared like an eagle. Due to its excellent weight distribution, the landing was perfect. The rear wheels came down first, and the car maintained good posture the whole way.

After running it for half an hour or so, I was convinced that this was the ultimate experience as far as R/C cars were concerned. But don't forget to heed the warnings of the manufacturer. Weighing in at more than 22 pounds and having a top speed of 40-plus, it's easy to imagine what this baby could do to a leg, so be careful.

And by the way, if you happen to see the tortoise, inform him that there is a new breed of racer in town, and its name

(Continued on page 77)



Landing and taking off from an aircraft carrier can be quite harrowing, but it's the true element of the incredible Grumman F-14.

THE MOVIE "TOP GUN" is going to make a hero out of the F-14. And Tom Cruise. And that's only right. However, to the aviation buff who has logged hundreds of hours in the dark watching old flying flicks, the movie is going to appear full of tired cliches (brash young flying genius beats the establishment, the enemy, and himself), technical improbabilities (not necessarily inaccuracies), and choppy editing.

But, if the moviegoer is truly an aviation buff, he is also going to find himself squirming in his seat trying to help Cruise pull lead on the "MiGs" which are actually T-38s and F-5s. You'll find yourself unconsciously contorting your head as you look for "bogies" over your shoulder while pulling high G, and you're going to have tears in your eyes when Cruise loses his good friend and backseater (NFO) in an accident. And, if you're any kind of flying flick fanatic, you're going to jump up and cheer when Cruise climbs out of his Tomcat and is mobbed by the deck crew after splashing two

(Continued on page 68)

Left: Fantastic shot of Tomcat with wings retracted. The F-14 is the most advanced fighter in the world. Right: Beautiful shot of F-14 with extended wings. Bottom right: Ready for the next mission.

F-14 TOMCAT

by BUDD DAVISSON

photos courtesy GRUMMAN

Tomcat

Grumman photo

Looks like something Luke Skywalker should be flying.

(Continued from page 65)

(or was it three?) MiGs.

And, if you have a drop of John Wayne patriotic enthusiasm, you're going to walk out of the theater wanting to jump into a cockpit and go kick some Libyan butts (or some other nondescript, but equally as hostile piece of national anatomy).

But you probably know all this already because, if you're reading this magazine, you're the type who has already seen the movie. Maybe twice.

And then there is the F-14; Tom Cruise may be the official heart-throb but the Tomcat upstaged him every time. And why not? What kind of biceps can compete with 40,000 pounds of thrust and no charismatic smile is going to last when you slam it into a 7 G pull-up to a vertical climb that makes the airplane disappear from sight. No sir, the F-14 was the star of "Top Gun."

Something that movies audiences will miss is the fact that the F-14 Tomcat, even though it looks like it's straight out of "Star Wars," is an airplane that first saw daylight under its tires in late 1970. The airplane is over 15 years old! And it's still so close to the top of the heap that the gap between it and any new generation hotdogs on either side of the Iron Curtain is tiny. Superior training makes that gap (if it exists) non-existent.

Tomcat in a banked turn. Note lethal armaments.

When the first F-14 flew it was to be a fighter. Not a fighter bomber, not a piece of combat utilitarian hardware, but a knock-down, cut-inside-the-turn dogfighter. It was supposed to go out and mix it up with the bad guys and its design included a lot of what we learned in the first half of the Viet Nam experience.

It's been said that, when all is said and done, war always boils down to a man with a rifle shooting at another man with a rifle. This has turned out to be true in the third dimension as well. With all the whizz-bang missiles that can home on everything but belly button lint, Nam showed us that gun fighters need guns or, in the case of the Tomcat, an M-61A1 20-mm Vulcan gatling gun. Although the missile will be the mainstay for most air-to-air engagements for generations to come, when it comes to aerial hand-to-hand combat, which almost always happens at well below supersonic speeds, the pilot needs to be able to reach for his holster.

But, it's not just the guns that make the Tomcat a dog fighter. This thing is made to turn and duke it out. Besides the high power and instant response of its turbo fan engines, its swing-wing is automatically giving the airplane what it needs to make the corner: a Mach Sweep Programmer computes the sweep needed considering the speed and altitude. In effect, when the pilot needs lots of G, but he's high and the air is thin, the computer gives him a longer wing. If he's slow, the airplane, like Johnathan Livingston Seagull, knows to stretch its wings in response to the demand for turning capability. Just the reverse is true if the pilot needs to get down on the road and wants the fastest, smallest wing he can muster. Yet another computer talks to automatic wing slats and tells them when to deploy and retract, depending on the angle of attack. As if all this lift control isn't enough, the bird has maneuvering flaps that can be cranked down with a

(Continued on page 107)

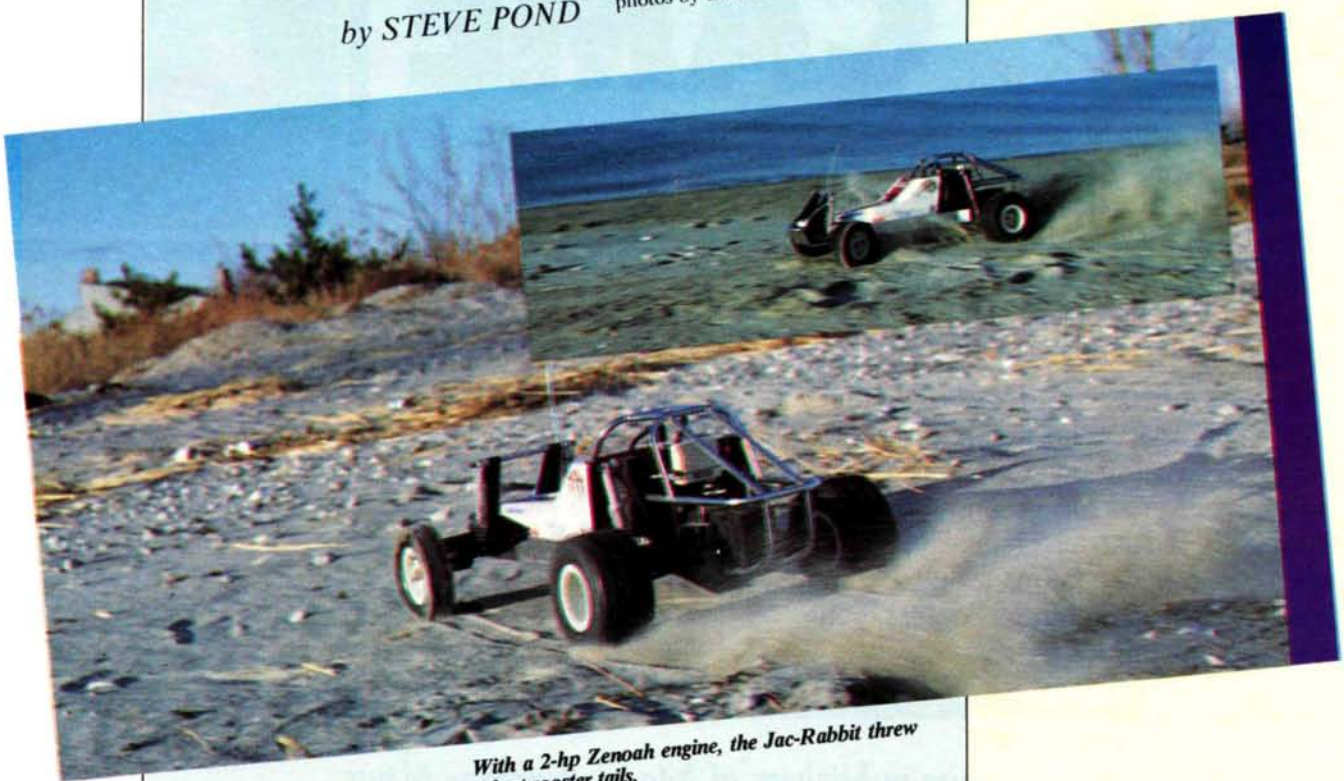
Super Sonic F-14 in another mode, nothing but pure combat hardware.

Road & Bench Review

RACO Jac-Rabbit

Kick some tails with the nastiest gas off-roader yet!

by STEVE POND photos by Louis DeFrancesco, Jr.



With a 2-hp Zenoah engine, the Jac-Rabbit threw 4-foot rooster tails.

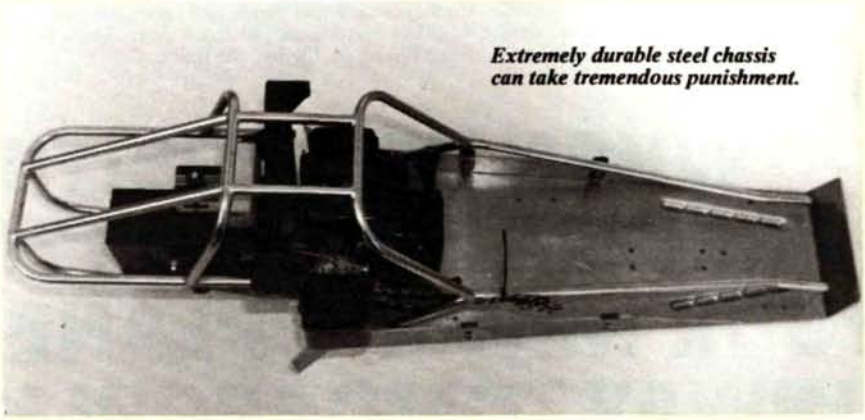
I'M SURE YOU'VE HEARD about the race between the tortoise and the hare. Because the tortoise was not capable of matching the blinding speed of the hare, he devised a plan to overcome this; his plan was to maintain a steady speed throughout the race to avoid refueling. The rabbit, on the other hand, figured that he could sprint from place to place, stop to refuel more often, and beat the tortoise.

You know how the race turned out. The wasteful tactics of the hare could not overcome the well-thought-out plan of the tortoise and the tortoise went home with the trophy. With this in mind, the engineers at Raco Modelcraft* went to work to try to find a better competitor for the tortoise. They finally came up with something that would turn the tortoise on its back; it's a new breed called the Jac-Rabbit.

THE KIT. The Jac-Rabbit is designed with the cunning of the tortoise and the speed and agility of the hare. This new breed of racer has an impressive list of features, which includes fully-adjustable four-wheel independent suspension with coil-over oil-dampened shocks and race-proven trailing arms at all corners. The engine is a Zenoah Max-Power 1.4 cid, which has a solid-state transistor ignition, an all-position diaphragm carburetor, fan cooling, a chrome-plated cylinder, and a quiet tone muffler. The engine also has an on-board starter, which eliminates the need for expensive starters. And if that's not enough, the engine runs on regular fuel and two-cycle oil, so kiss the exotic and expensive fuels goodbye.

The Jac-Rabbit has other features, such as a fully enclosed centrifugal clutch, all gear drives, disc brakes, heavy-duty hi-load servos, heavy-duty precision sealed ball bearings, and semi-pneumatic neoprene tires mounted on reversible three-piece wheels. Did you buy one yet?

CONSTRUCTION. Most of you are probably saying "twice as big, twice as hard to build." *Wrong!* This is as easy to build as any 1/10-scale beginner car. In fact, it's easier because not only is it more than halfway finished from the factory, but it's bigger so you don't need fingers that resemble tweezers. To complete the Jac-Rabbit you'll need 5/32 and 7/64 Allen wrenches, and 3/8, 7/16, and 9/16 open-end wrenches. The other supplies you need are paint, a two-channel radio, four sub-C size nickel-cadmium rechargeable batteries, and a fifteen-minute quick charger.



Extremely durable steel chassis can take tremendous punishment.

First paint the body and chassis. This can be done now because there are no modifications needed on the body. I chose not to paint the chassis because I like the look of aluminum and it would probably get scratched the first time out anyway. When the body paint had dried, I added the decals supplied with the kit. The decals included are from Autographics*. If the decals supplied are not suitable for the paint scheme you've chosen, you can choose from the wide variety of other beautifully detailed decals that include some of the biggest sponsors in the racing world.

Now it's time to begin the construction. It's not necessary for me to rewrite the entire instruction manual because each step is completely explained and is accompanied with a photograph. I'll just touch on each step and give a little advice along the way.

Assemble the rear suspension and install the ignition module. Locking nuts are supplied to fasten the ignition module, but for all other fasteners I highly recommend using a thread-locking compound like Pacer's Zap-Loc.

Next assemble the front suspension and chassis. Exercise a little care when tightening a screw into a nylon or plastic part because these are very easy to strip if you're not paying attention. You'll need snap-ring pliers for this step. I tried to get the snap rings on with a screwdriver but the time and aggravation spent to do this was well worth a pair of snap ring pliers. They will also be needed to remove and install the half shafts if any maintenance is required.

Install the front shocks and spindles. This step is spelled out very well and should be no problem.

(Continued on page 58)

Radio transmission was supplied by Airtronics XL2P Pistol Grip.

SATURN 20L

No Building. No Sanding. No Painting. No waiting. Just install the radio, hook up the pre-installed linkages, and the low winged Saturn 20L gives the experienced pilot fast and responsive performance (also available in a shoulder wing configuration). Span: 48 in., Area: 390 sq. in., Engine: .25, Radio: 4 ch.

CESSNA 40

Another RTF breakthrough for RPM. Our new Cessna 40 combines scale good looks with RPM instant assembly and stable flight characteristics. It's a perfect and unique .40 size trainer. Span: 64 in., Area: 610 sq. in., Engine: .40, Radio: 4 ch.

SNARK 5T

The RPM Snark 5T has everything electric flyers want; high performance, low maintenance and operating expense. Neat, clean, quiet and ready to fly in minutes. Join the fun, fly the silent world of electric flight! Span: 44 in., Area: 347 sq. in., Motor: .05 electric, Radio: 3 ch.

WHEN YOU POSITIVELY, ABSOLUTELY, HAVE TO HAVE YOUR NEW R/C PLANE ON THE RUNWAY TOMORROW MORNING.

RPM. EZ kit construction made even EZer!

When it comes to cutting down assembly time for R/C model aircraft, nobody takes care of you like RPM.

Only RPM uses EZ construction and advanced design to give you a hand-built airplane complete and almost ready to fly.

No special tools. No building. No painting. No previous experience required!

Completely complete!

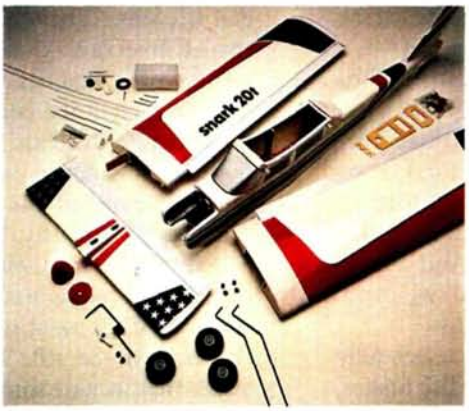
RPM includes everything you need: engine mount, fuel tank, landing gear, spinner, the linkages, the works.

The pushrods are factory installed and even the colorful markings have been beautifully pre-painted.

About all you need to do to get airborne is bolt in the engine, install the radio and fill up the tank.

Speed isn't everything.

Unlike ready to fly kits that sacrifice performance for ease of assembly, RPM models are as easy to fly as they are easy to put together.



RPM's expert craftsmen do the work for you, pre-finishing the fuselage, wings, and tail surfaces.

RPM's exclusive hand fabrication and special composite materials reduce weight to a minimum. Wing, tail and stabilizer alignment is assured by our mistakeproof, pre-jigged design.

And to give you the most stable flight, even in moderate wind, RPM uses wings with specially designed airfoils.

So go for it. With RPM there's just no reason why you can't be flying your brand new plane the day after you buy it. See your hobby dealer for complete details about the exciting new RPM hand-built ready to fly models.

TRYSTAR 15

Designed and priced for quick takeoff, the Trystar 15 is great news for novice weekend flyers. Steerable nose wheel, vacuum formed cowl, pre-finished foam wing, and pre-installed pushrods are among the extra features you can expect from RPM. Span: 48 in., Area: 380 sq. in., Engine: .15, Radio: 3 ch.

RPM

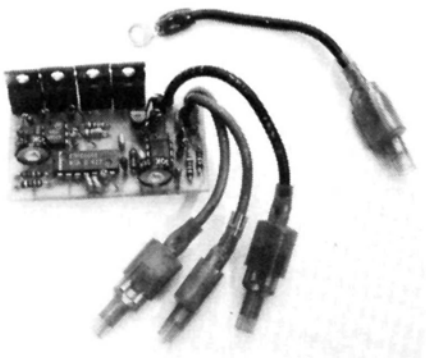
IT'S ABOUT TIME!

VARICOM: 18480 Bandilier Circle
Fountain Valley, CA 92728-8610
In CANADA: Richmond R/C Supply, Ltd.
8071 Alanmore Pl., Richmond, B.C. V7C 2B6

Control Tower

by CHARLIE KENNEY

THIS MONTH I'D like to catch up on some products I've seen at recent trade shows. The first item is the new SC-4 electric speed controller from Jomar*. The SC-4 was designed to replace the older Jomar SC-1 and 2. Advances in MOSFET (Metal Oxide Semiconductor Field Effect Transistor) transistor technology keep raising efficiency, leading to lower losses and, consequently, more flying time. The new unit uses four MOSFETs for a voltage loss of only .015 V/A. A conservative current rating for this unit would be 40 amps continuous. An optical isolator is used in the front end to offer 100% isolation. Other designs put the isolator in the output stage only, and the receiver battery pack powers all the speed control circuitry. The SC-4 uses a voltage regulator to power the circuitry from the motor pack. The motor protection diode is now on the board and is a Schottky type. Both the neutral and rate are adjustable to match your transmitter stick response. Last of all, the motor and battery leads come soldered to the board and have insulated spade connectors. Here is a description of the circuit from its designer, Joe Utasi, president of Jomar:



Jomar SC-4 speed control, very versatile.

"The SC-4 represents the latest in electric speed control technology combined with plenty of actual field testing. Low current requirements permit safe use with receiver battery packs as small as 150 mAh. Optical coupling up front combined with a separate voltage regulator assures noise-free operation. A slow motor speed time constant eliminates the 'burp' which usually occurs on takeoff when flying over other transmitters. Last of all, the latest power MOSFET transistors are used to get the best possible efficiency out of the speed control. Typical voltage loss for the SC-4 is less than .015 V/A. Conservative current rating is 40 amps continuous."

photos by SUE KENNEY

W.R. Brown's Sandblaster, many unique applications.

Although the SC-4 is very efficient, it's necessary to attach a small heat sink to the transistor tabs before operating the speed control. The heat sink can be aluminum or brass, and as small as 1x2.5 inches. It serves two purposes: it literally connects the four transistors together electrically, and it carries away heat and keeps the MOSFETs all at the same temperature. The optimum mounting is to place the heat sink plate on the bottom surface of the fuselage directly in the propwash. While the heat sink doesn't get so hot that this is mandatory, the cooler you can keep the MOSFETs, the more efficient the speed control will be. The fact of the matter is that the "resistance" of the transistors is proportional to their temperature—and this goes for any speed control using MOSFETs.

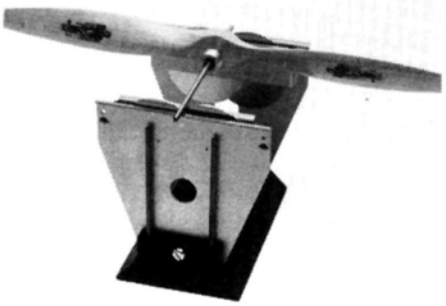
The SC-4 is supplied pre-wired, with the exception of the receiver lead. To install the receiver lead, simply strip about 1/8 inch of insulation from the end of each wire and carefully solder the wires to the holes at the left side of the PB board as indicated on the parts layout drawing. The motor and battery wiring has already been installed for you and mating connectors are provided. It's highly recommended that you use the mating connectors. They are highly reliable and provide a low loss connection. To attach the spade connectors to your wiring, strip back about 5/16 inch of insulation, insert the wire in the connector and crimp the neck in a pair of vise grips or a bench vise. When properly installed, you should be able to tug on the connector and it should stay put. Be careful not to mix up the battery and motor connectors, since this could possibly destroy the MOSFET transistors,

W.R. Brown's airbrush system with quick disconnect bottles.

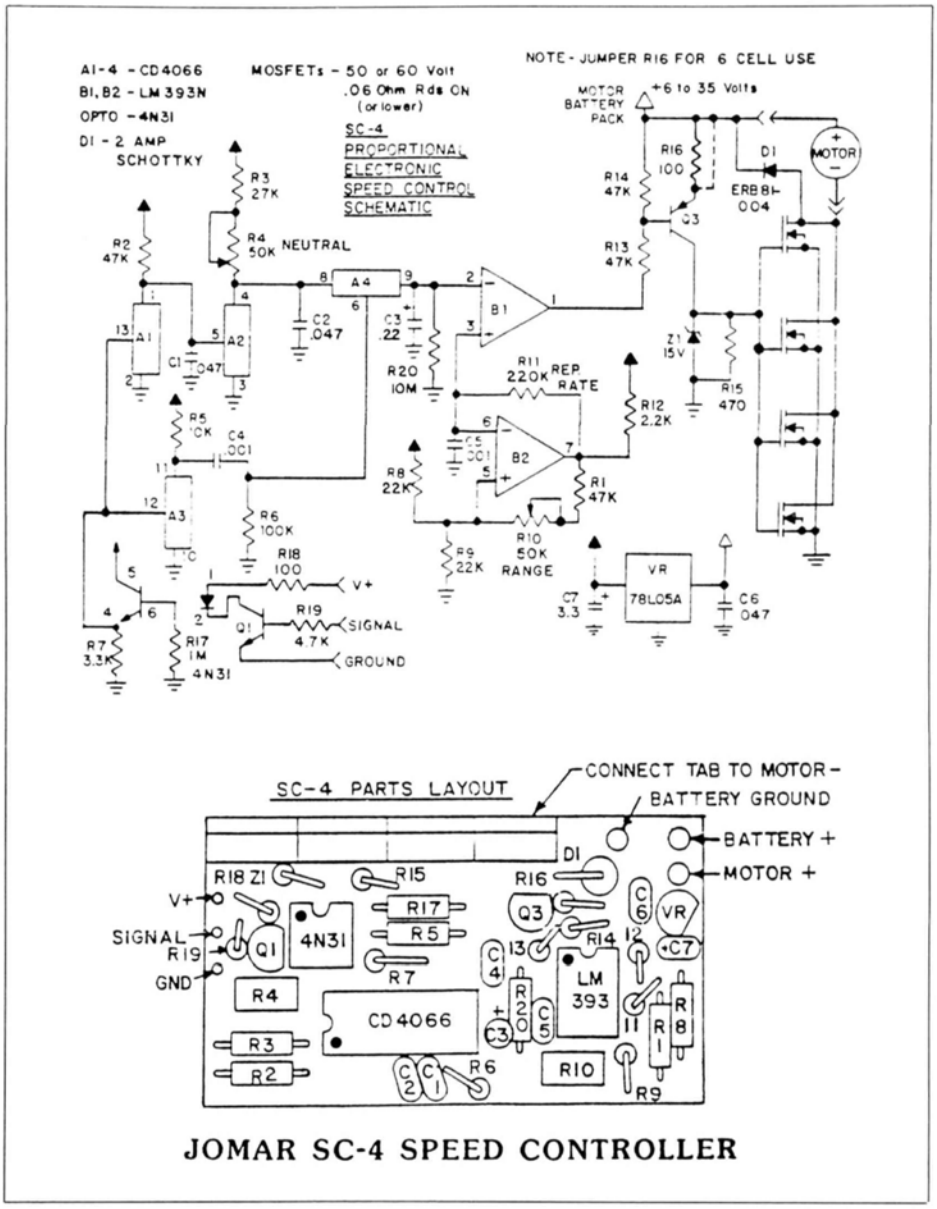
resulting in unnecessary and expensive repairs.

There are two trim pots on the board. R4 adjusts the neutral timing and R10 adjusts the range. The range trim pot will match the On and Off points of the speed control to agree closely with the end points of your throttle stick. It is wise to allow a little "extra" on the Off end of the stick travel to be on the safe side. There's a little bit of interaction between these two adjustments, so it might be necessary to do a little "tweaking" to get things just right, but it's not hard to do.

In the event of loss of transmitter signal, the SC-4 will shut off, preventing fly-aways or surprise takeoffs. In order to achieve maximum efficiency, there's no overcurrent protection in the SC-4. If you are accident prone or crash frequently, it's highly recommended that you install a fuse in series with the motor. This will protect the motor, battery pack, and speed control in the event of a stalled prop with the throttle in an On condition. I'm looking forward to flying the SC-4 shortly in my Super Monterey. The SC-4 measures 2½x2¼x¾ inches and weighs about an ounce.



High Point Precision Balancer has many uses. See text.



JOMAR SC-4 SPEED CONTROLLER

just over 10 pounds, and sits on four rubber feet.

The basic airbrush provided was a model HS 832 with a medium nozzle used for most general work. This unique airbrush will spray practically any liquid and features external mix, snap-out fluid nozzle for easy cleaning, adjustable airflow for precise spray pattern, and snap-lock jar to prevent accidental separation. The HS 832 can be used with any compressor supplying up to 45 psi of regulated air, in either a bleeder or a non-bleeder type compressor.

In addition, W.R. Brown has provided "fine" and "heavy" fluid nozzles which also fit the basic airbrush. Also provided to me were extra 1- and 2-ounce bottles. The nozzles are easily recognized by grooved rings numbering one, two, or three for fine, medium, and heavy spraying respectively. Usually the fine nozzle is used for spraying water colors, inks, or dyes; the medium is for enamels, lacquers, and acrylics; and the heavy nozzle

(Continued on page 100)

My next topic concerns a product I saw at the RCHTA Show in Chicago last October. W.R. Brown* of Chicago, Illinois, manufactures a great line of hobby-type compressors and airbrushes. They have a system for just about any application.

The particular unit I'd like to discuss is the basic HS 430 system, consisting of the 410 compressor and HS 832 airbrush. The HS 410 compressor is a diaphragm-type compressor delivering 1.0 CFM of air to 20 psi. The air is clean and oil-free. Ball bearings employed in the compressor never need lubrication. The compressor measures about 8x6x7 inches, weighs

New Dynathrust 14x6 props. Note tip bands.

JAC-RABBIT

(Continued from page 62)

is Jac-Rabbit!

**The following are the addresses of the companies mentioned in this article:*

Raco Modelcraft, Inc., 1421 E. St. Andrews Pl., Santa Ana, CA 92705.

Autographics of California, 1700 14th St., Bakersfield, CA 93301.

Pacer Technology & Resources, 1600 Dell Ave., Campbell, CA 95008.

Airtronics, 11 Autry, Irvine, CA 92718. ■

MAJESTIC MAJOR

(Continued from page 44)

The rest of the work is routine: capping the center section, adding leading edge sheeting, sanding tips, etc. The total time for this was about eight hours spread over five evenings.

The construction of the tailplane and fin is entirely straightforward but I suggest that you spend some time with a sanding block to taper both items toward their extremities and form clean, sharp trailing edges. The weight savings is important because, with such a long moment, the unit exercises a considerable influence on the CG.

Building the fuselage is no more complex than, say, that of a Pacific Ace—that is, two slab sides built one on top of the other. The same rules apply also; lighter cross members toward the back end. If you're using cyanoacrylate, place a sheet of mylar between the sides or you'll end up with a single, very thick side!

The plan advises raising the rear of the paxolin engine mounting plate to provide down thrust. Instead, I chose to plane the bearers to the required angle. If you use one of the latest four-strokes, increase this angle from 2° to 3°, as these have more power than the O.S. 60FS, which powered the prototype.

The undercarriage is pre-bent $^{3}/_{16}$-inch piano wire. I used J-bolts to attach the wire to the ¼-inch ply formers. Whichever method you choose, drill all holes needed *before* building the formers into the fuselage. This way you can leave the landing gear out until the fuselage is complete on the building board—a nice aid to accuracy.

Fit in the tank and position the throttle servo in such a way that it will link up but not foul the tank's side. Fit the elevator

(Continued on page 82)

Pattern Matters

by MIKE LEE

LET ME START out this month with a review of a new aircraft kit from Austria. It's made by RogaModell of Austria and is distributed in the U.S. by AMS Imports*.

The model is the now-famous Dalotel, versions of which have been flown by notable pattern jockeys around the world. Indeed, this particular model was designed by Hanno Prettner. It's available in two basic sizes, the 150 and the 2000, and both come prefabricated. The construction is balsa, ply, and obechi over foam on the wings. Mine is the Dalotel 150, a .21- to .60-powered ship.

The kit box contains a very high quality aircraft that features an assembled fuselage with decks, obechi-sheeted foam wings, sheet balsa tailfeathers, plastic canopy and cowling, all necessary hardware, and appropriate instructions.

Within a mere 6 hours, the airframe was ready to accept covering for which I selected Top Flite* Super MonoKote.

I mentioned before that the aircraft will accept engines in the .21 to .60 range. That was something I found hard to believe, but if you were to feel the incredible light weight of the Dalotel, you'd understand. The all-up weight with radio and engine is just over 5 pounds! And this was with a .60 engine and full-size radio gear.

My Dalotel 150 is equipped with an Airtronics* XL 6 system using standard-size servos and a 500-mAh battery. Power is provided by a side-exhaust engine without pipe. The ship itself uses a Curare airfoil with beveled wing tips, similar to the later Magic wing by Prettner. The wing has front leading edge sweep only, and strip ailerons. A 12-ounce tank fits nicely in the nose of the ship, and I left the airframe as a fixed gear tail-dragger. As you can see in the photos, she's a nice looking ship.

On an 11x7 Zinger prop, the Dalotel went down the runway just as pretty and as straight as you please. Lift-off occurred just about 125 feet later, with a bit of down trim added. Let me tell ya, this is one nice handling ship. She is rock solid,

Author Mike Lee prepares RogaModell Dalotel for its first flight, which went flawlessly.

with very positive response from all flight surfaces. She is real gentle on stalls, and a pussycat on landing. Boy, what a great flyer with absolute pattern performance. No wonder Chip Hyde likes this one.

All in all, the RogaModell Dalotel 150 is an excellent value at a retail price of $130. Considering the quality and high level of prefabrication, it's worth twice the price.

Extensively prefabricated, the Dalotel kit is a snap to assemble.

Noise

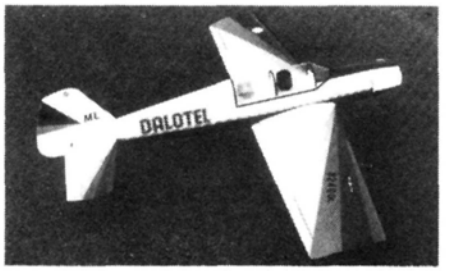
As you know, the subject of noise has been quite controversial. It's been blamed for the loss of a number of flying fields and was a driving factor behind the push to fly with four-stroke engines. For now, however, let me settle the score between four-stroke and two-stroke noise.

It has often been said that a four-stroke engine is quieter than a two-stroke engine of only half the size. And, while this apparently sounds true on the flight line, *it is not*. The four-stroke engine has been proven to emit noise levels almost equal to its two-stroke counterpart. Take, for example, a 1.20 four-stroker versus a piped .60 two-stroker. Any decibel meter will show you that the noise emitted in actual decibels is almost the same, give or take, say, 5 decibels. Now consider that pattern jockeys are using either a piped .60 two-stroker or a good strong 1.20 four-stroker. At least this is what is commonly seen, as very few pattern jocks use anything smaller than a 1.20. The four-stroke engine is nearly 35% heavier (in some cases) and has twice the displacement, yet it flies the same size machine. That tells you that the four-stroker has to be twice as large as the two-stroke engine to effectively pull the airframe through the air at the performance levels we desire. All that for a savings of only a few decibels is not really worthwhile in my book, at least not from a practical standpoint. The four-stroker is also more expensive and requires additional upkeep.

But this lecture is on noise, so let me stay with that. What we are hearing is a difference in tone. The two-stroke engine emits a sound which is high in pitch and frequency. Higher frequencies penetrate the air better, and that makes it less pleasing to the ears. The frequency of the four-stroke engine is lower in tone and doesn't bother the ear as much as the higher-pitched two-stroke sound, but the sound level is the same! What does this tell us? It means that the four-stroke engine isn't the total answer to the noise abatement problem. The sound will carry

just as far as any other sound, and we are paying a premium price to merely change the tone.

I recommend more effective muffling of our present two-stroke engines. Don't get me wrong, I'm not against using the four-stroke engine for modeling. I just believe that pattern will not benefit appreciably from four-stroke use at this time. These engines are an absolute must for scale pilots who are striving for realism, and sport pilots just eat 'em up.



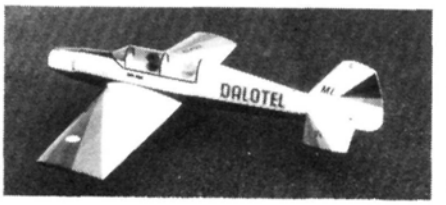
An attractive color scheme, such as Mike has done, can impress the judges.

So what can we prescribe for the noisy piped two-strokers? I was talking recently to TOC champ, Steve Rojecki, who is currently flying F-5 Aggressors at Nellis Air Force Base, Nevada. I had watched his "old paint" Brushfire fly the FAI maneuvers, and noted that the sport aircraft were drowning out his engine. A quick look at Steve's bird revealed a standard .60 engine, a standard (?) pipe, and all the other normal things a pattern bird sports. When asked about the apparently quiet bird, Steve said he was using a Rossi pipe. Big deal, so do I, but mine is much louder. Steve revealed that his was not the standard Rossi pipe, but was instead a Rossi boaters pipe. It seems that the marine pipe has an extra internal baffle, accounting for not only the lower noise levels, but for a broader range of boost from the pipe.

Steve said that he hadn't noticed any difference in the back-pressure from the pipe, nor any appreciable weight difference. Yet, the pipe is a whole lot quieter. If anyone else has tried this pipe combination with the same results, drop me a line and let me know. For that matter, let's all put our heads together and see what the pattern fraternity can do for the rest of the R/C brethren. Don't forget, many look to the competition people to develop the products they will use in sport and play. Don't let them down.

Glowplugs

I'll bet you didn't know that a lot of the engines we use from Europe and the Far East are meant to run on no-nitro fuel. Well, even if you did, many modelers don't realize what this can mean.



The Dalotel kit is made by RogaModell of Austria and distributed in the U.S. by AMS Imports.

An engine designed to run on no-nitro fuel can not only save you money in lowered fuel costs (you can fly with cheaper low-nitro fuel), but they can also give you fits when it comes to keeping them running. It seems that these type engines have deep cooling fins around the cylinder. This makes for a happy situation when maintaining a cool engine, but this same cooling effect can put out the fire if the glowplug isn't hot enough.

To ensure that the plug stays lit, carefully match the heat range of a plug to the type of engine and fuel you use. While one guy can easily keep a Rossi going on a rather cool plug, the next one can't even get his Rossi to fire. It takes time to match a plug to your own engine/fuel combination, but it will be well invested time when the engine keeps

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Giant Steps

by DICK PHILLIPS

HOW OFTEN HAVE you run into a problem during construction or while flying and remembered reading something that was the solution to the problem, but you couldn't recall where or when you read it? Not many of us keep our magazine collections so well organized that we can immediately find the article we need, so we muddle our way through the problem because we can't find the solution we know exists. Well, help is at hand. Lou Guerrieri of San Carlos, California, is in the process of cataloging all material which has appeared in the major modeling magazines over the past ten years and which applies to the building of large models. It's a monumental task and it's one few of us would have been willing to attack.

Lou is a lawyer and is IMAA's legal advisor for safety. He's an active model builder and has probably just earned the gratitude of many of us for his efforts in making these catalogs available. The catalog covering *Model Airplane News* is currently available and the version for IMAA's *High Flight* is almost ready and will be on the market (or very close) by the time you read this.

These directories are well organized and are set up so that finding material on specific subjects is easy. For example, the *M.A.N.* guide covers 1975 through 1985 and is subdivided into six sections: aircraft construction articles; construction information, products, and techniques; engine information, accessories, and products; product announcements and reviews; radio equipment, information, and installation; and miscellaneous.

The *M.A.N.* guide is 52 pages and sells for $6.95 from Glideline Publishing*. I don't know how any of us will be able to get along without these catalogs. Not only will they guide us to things we wouldn't be able to find otherwise (without a lot of looking), but they'll also serve to remind us of things we've forgotten. They might just get us to organize our back issues as well!

History in the making—the lineup of convoy vehicles awaiting takeoff of air mail delivery models.

Fiber Optics for Servo Leads

We are surrounded by high technology in everything we do these days. Our radios are the result of technical research and development, as is almost everything we use. Now Pelican Enterprises* has brought some additional high tech to the hobby.

Peter Cary loads the mail into his ¼-scale Taylorcraft.

Regular readers know I frequently suggest that long servo leads in our models need some sort of added protection to cut down on the likelihood of stray signals being radiated. Long servo leads can radiate a signal, just as our antennas do, and that signal can be picked up by the receiver, amplified, and fed to the servos in our models. The signal is false naturally, and it can drive our receivers wild and possibly result in the loss of a model.

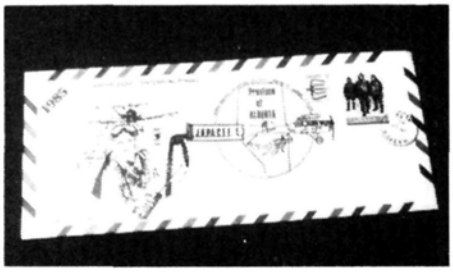
It is interference, of course, but it isn't from some source we can't control; it's coming from inside the model. Pelican Enterprises offers a simple solution in the form of a fiber optics conversion, which can be used in place of long servo lead installations and which produces no interference at all.

The kit is quite simple and installation shouldn't give the proficient model builder any trouble. Basically, the signal from the receiver to the servo is converted into infrared light, which is channeled through a fiber optic to the remote servo location. The signal is then converted back to an electrical impulse and fed to the servo just as if it were coming in over a wire. The servo reacts as it would

normally and the control surface is moved.

The technology of fiber optics is not new, so this is not an experimental device. It has taken proven technology and adapted it to our use. I have no way of knowing how many models have succumbed to internal interference, but I do know there have been many unexplained crashes and glitches which might not have happened if there had been some protection on those long servo leads.

As with every device we use, there are good and bad points. The one drawback I can see with the optic servo driver unit is that if it's necessary to remove the part



Front of envelope postmarked to designate 100 years of Canada's National Parks.

with the driver system in it from the rest of the airplane, the connection is not as convenient as unplugging a servo lead connector.

The battery that drives the unit can be the receiver battery itself, or you can choose to add a second battery pack to drive the unit, even to the extent of adding a battery at the servo location itself. This eliminates the servo signal wire, which is the most likely to cause the problems we can experience when long servo leads are installed.

Pelican Enterprises also has a number of other items available, most of them related to personal safety. Drop them a note and an SASE for a catalog. And, if you aren't satisfied with any purchase from them, they'll refund your money. Now that is a rather novel approach!

Model Air Mail

A rather unique event recently took place here in western Canada. I thought you might like to hear about it, and if you've heard of anything similar being done elsewhere, I'd like to know. It's

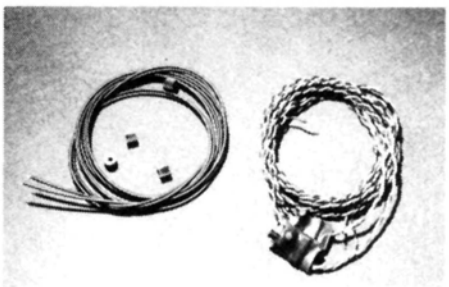
Reverse side of envelope, now a collector's item.

called Model Air Mail. Through the cooperation of Canada Post, the Yellowhead Stamp and Coin Society, and members of several local model airplane groups, 1,500 pieces of mail were carried a distance of 40 miles.

The event was conceived as a means of celebrating the centennial of Canada's National Parks in a meaningful way. Piet Steen of the Stamp and Coin club was the spark plug for the event, with cooperation from Canada Post, the Hinton R/C Flyers, the Edmonton Radio Control Society, and the Edmonton Capitol City Fliers. Seven models made the flight carrying the 1,500 pieces of special mail, and about 50 fliers, support people, and onlookers were involved.

The event took place in September and included flying through Canada's Rocky Mountains. It was both cool and windy, trying the skills of the pilots to the limit. At times, with a brisk tail wind, the models were flying 85 mph, creating a problem for the drivers who were legally required to observe the 60 mph speed limit. This required the pilots to circle in a narrow valley, under less than ideal conditions, in order to retain sight of their airplanes. Despite these hazards, only two models had to land and were unable to continue. The mail from these planes was marked, "Plane Crashed, Mail Recovered"!

In addition to the problems of flying in gusty wind conditions, the highway through the mountain parks didn't provide for much in the way of emergency landing sites. The pilots, in addition to



Pelican Products fiber-optics kits used to extend servo leads without interference. More in text.

concentrating on maintaining control of their airplanes, had to keep an eye out for emergency landing sites in case of an engine-out or any other problem. The highway was open to normal traffic so an emergency landing required considerable care.

The event was judged a success by all who participated and it provided quite a unique experience for those involved. It was decided that model airplanes probably would not supplant more conventional ways of moving the mail!

You can imagine the skill required to keep a heavily-loaded model airborne

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MAJESTIC MAJOR

(Continued from page 77)

servo and pushrod, which will need bracing over its considerable length. Blocking in the nose and completing the wing platform/cabin are the last major segments of construction. Twenty hours spread over three weeks seems like a fair estimate for this work.

A model of this style needs brightening up with some bold colors. I chose red and yellow from the Solartex range. This superb iron-on fabric is available in the U.S. from Hobby Shack* and is well worth tracking down. Depending on how you decide to decorate the model, some 6 or 7 yards of fabric will be needed. I did the neat trimming between the color edges with ¼-inch self-adhesive striping bought from an auto-body shop. If applied in a warm room, this tape will turn quite sharp corners. I also sprayed on two coats of fuel-proofer to seal the surface against fuel.

Do try to find some suitable wheels as these really complete the model. Balloon air-wheels look best. I chose Airtop, which are French and may not be available in the U.S., but I'm sure a suitable alternative could be found.

FLYING. This was the best of times and the worst of times, especially because I'm a near full-time control-line racer and only a part-time R/C enthusiast. Range-check was okay, and the Laser was running strongly and reliably. On no more than half-throttle the Majestic Major was up and away. The next few minutes showed that full down trim was needed, so I recut some of the tailplane platform. The next day I achieved neutral trim at the modest power needed to fly this vintage model.

It's worth saying that with a model such as the Majestic Major it's possible to make certain decisions about how to set it up. Remember that at base it's really a free-flight model and power is supposed to make it climb briskly. The more power, the more dramatic the rate of climb. If you wish to reduce the use of trims, reduce the wing incidence during construction of the fuselage, but be prepared to use the trims as well as using the throttle with restraint.

My choice for takeoff and height gain is ¾ full down trim, half-throttle, and half right trim on rudder. For cruising I like ¼ throttle, neutral rudder, and ½ down trim on elevator. For gliding I have the engine cut or on tick-over, ¾ up trim on elevator.

I've now put in about eight hours total air time, which is sufficient to say this model is an excellent flyer with super safe slow-flying characteristics. Best of all is its presence in the air: large, colorful, and pleasing. Try one!

**The following are the addresses of the companies mentioned in this article:*

Tower Hobbies, P.O. Box 778, Champaign, IL 61820.

Neil Tidey, AGC Sales, London Rd., Apsley, Hemel, Hempstead, Herts, U.K.

Striegler R/C Supply, 5831 McKnight, Houston, TX 77035.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728. ■

BARNSTORMER

(Continued from page 61)

not expect a metal case, no-slop adjustable sticks, electronic trims, dual con-

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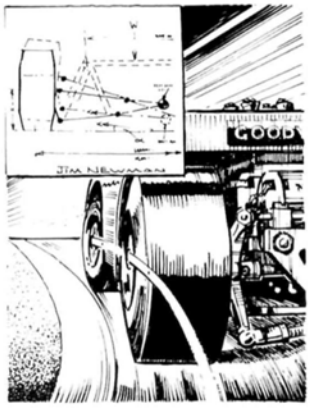


Inside Track

by MIKE LEE

AS YOU KNOW, the game of racing cars involves driving skill, speed, dependable equipment, speed, practice, and speed. Since speed is a major factor in this game, let me tell you about an item that will help you gain speed: ball bearings.

What is the advantage of having ball bearings in your car? Simply put, ball bearings offer less friction to the moving parts of the vehicle than do standard bronze bearings. Most car kits are equipped with bronze "Oilite" bearings, the microscopic surface of which looks a lot like a sponge. In fact, that's exactly what the bearing was meant to do with lubricating oil: sponge it up and hold it in the pores of the metal. This sponge action allows the bearing to hold oil in place right where it's needed to lubricate the moving parts within the bearing.

Oilite bearings work very effectively, particularly when they are broken-in correctly. They offer little rolling resistance on the bearing surface. However, Oilite bearings are susceptible to fast wearing when their surface is contaminated with dirt and debris. The surface is quite soft and a spec of dirt only as large as a micron can score it significantly enough to cause an increase in drag. Put this same bearing into an environment where an R/C car operates, and you have a great deal of dirt invading the bearing surface and the bearing will not last very long. Note, however, that these bearings are economical.

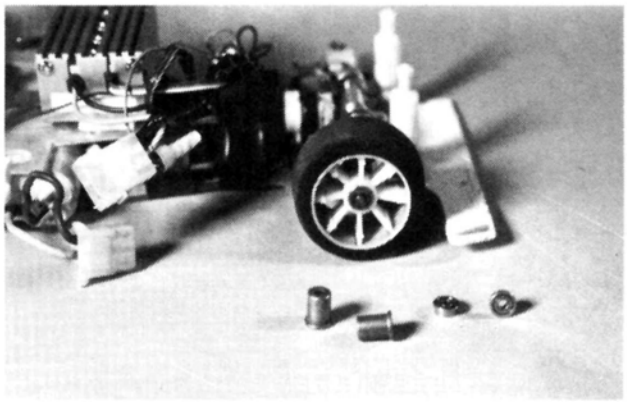
Ball bearings are normally constructed of tempered steel balls in contact with equally tempered steel races. The ends of the bearings are either capped to hold them together, or they have ball cages to keep them in one piece. The ones commonly used are the capped or sealed ball bearings.

The very nature of the bearing material should tell you that the ball type should withstand much more abuse than the Oilite type. Also, I mentioned that the bearings we use are sealed. This adds to the protection of the bearing surfaces. And the fact that the moving part is rolling on the balls of the bearing rather than sliding along an oiled but porous surface of an Oilite bearing should tell you that the ball type offers less overall drag to the moving parts.

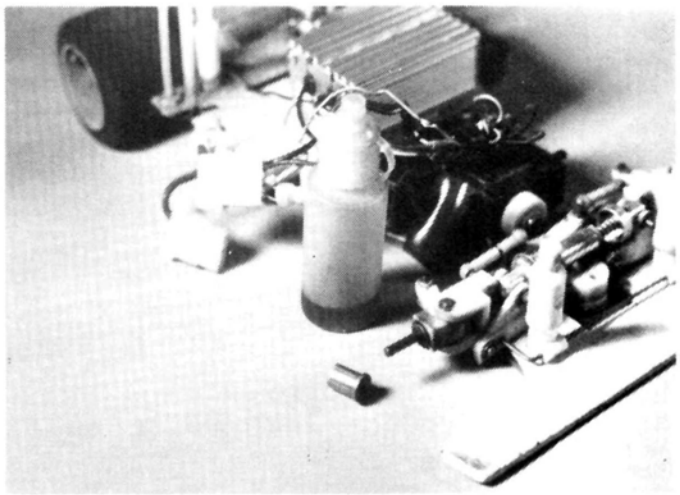
No doubt, ball bearings are superior in their ability to reduce frictional drag to the Oilite bearings. But the cost of ball bearings is high. The average cost of a single ball bearing is around $5 retail. For the same amount, you can purchase quite a few Oilites and manage to keep friction to a minimum.

Granted, $5 isn't a lot for a bearing, but multiply that amount by the number of bearings your car needs and the cost is pretty substantial. Ball bearings last a lot longer and they are significant in contributing to the overall speed of a car, whether on- or off-road. If you are serious about killing the competition, than ball bearings are the way to go. If puttering around open lots is what you fancy, stick to Oilites and have fun.

By the way, I mentioned that you have



Bronze Oilite-type bearings on left versus ball-type bearings on right. Note it takes two ball-types to replace one Oilite.



Oilite type bearings require plenty of oil to work well. Dirt and grit must be removed regularly.

to break in Oilites to make them really work effectively. This is easy to do. When new Oilites are installed, oil the bearing thoroughly with a light, but clean oil. Three-In-One oil works great. Carefully insert the moving parts into the bearing, making sure that any excessive pressure needed to insert the piece is avoided. If the item is tough to insert, find the cause of the hang-up and eliminate it. Once the parts are installed, break in the bearing by making the item move in the desired direction through the bearing. Do this slowly at first and then build up speed. Should the bearing at any time begin to drag, add oil and make sure that nothing else is causing the drag. Continue working the item through the bearing, keeping plenty of oil in it, until you can get the part to spin or move with almost no effort. An axle for the wheels may spin for quite some time when the bearing is properly broken in. In some cases, a well-broken-in Oilite rivals a ball bearing in drag reduction. Try it on your next car and see. And keep them oiled!

Another speed modification that many newcomers ask about is motor balancing. What does motor balancing do for you? Well, first it applies strictly to the electric crowd, so you gas guys can take a break.

Motor balancing in electric motors refers to dynamically or statically balancing the armature of a motor. A balanced armature smooths out the rotational action of the armature, allowing it to rotate faster. This is much like balancing the tires on a full-size car; an unbalanced tire will eventually begin to hop. This hop is not only bothersome, but it robs the car of horsepower by trying to power around the hopping resistance. It's much easier to roll something smoothly on a surface than to dribble it.

A balanced armature can add up to 20% more rpm than the same armature unbalanced. While a different combination of wire windings and wire gauges on the armature can dramatically change its torque and speed, balancing is one of the best ways to push additional speed from a motor.

Note that a balanced motor also contains ball bearings at the end of the armature shaft, causing a reduction of drag and potentially more speed.

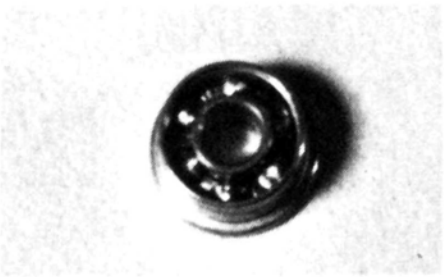
You can tell if a motor has been balanced simply by looking at the armature. An unbalanced armature looks like three rectangular posts with wire around the posts. A balanced armature looks similar, except there are small, shallow drill-bit holes on the surface of the posts. By removing small amounts of metal on the posts, a heavy post can be lightened to match the other two posts. When all three posts weigh the same, the armature is statically balanced. A dynamic balance is attained by spinning the armature and determining a heavy post during the spin. Most armatures are static balanced.

There are plenty more speed secrets to be revealed and each one makes a contribution to the overall speed potential of a race car. This is definitely a case of "every little bit helps."

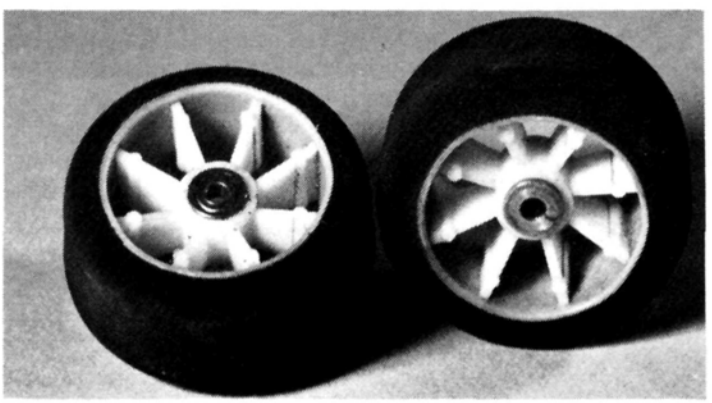
I hope to soon be reviewing the legendary Associated RC12i electric road racer. This 1/12-scale road runner has gone through numerous modifications and each mod enhances this car's ability to bring a driver to the winner's circle. It has been there countless times already, and has been labeled as *the* car to beat in 1/12 scale. Watch for this one, you'll like it.

The West Coast racing scene was really hot this past winter and I hope to bring you some race coverage in the future. 'Til then, happy motoring and stay in contact with the road.

Mike Lee, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■



This closeup of a ball bearing reveals precision tempered balls running in hardened steel races; measures 3/8 inch across.

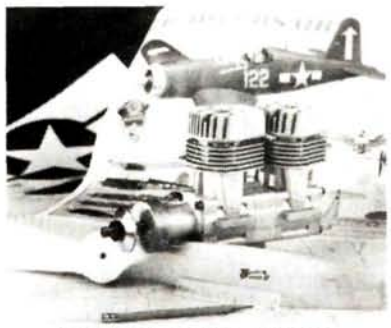


Bearings installed in front wheels of a 1/12 road car. Left, ball bearing setup; right, Oilite bearing.

Product News

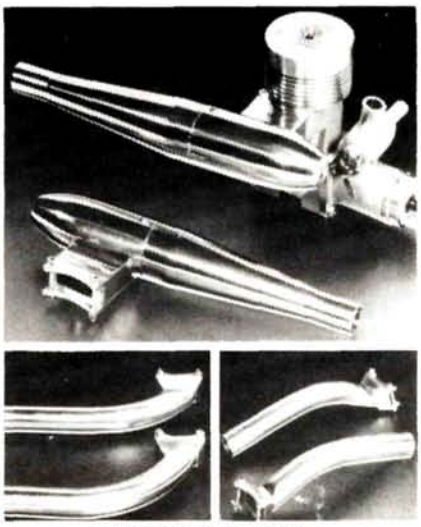
NEW COWLS FROM T&D FIBERGLASS

T&D Fiberglass Specialties (30925 Block, Garden City, MI 48135) introduces six new cowls to their line of fiberglass products. Back row, left to right: Balsa USA's Citabria Pro; Nosen (A+A) P-51; and RCM #957 Flybaby. Front row, left to right: DGA's Funk; A+A's .40-size Citabria Champ; and *M.A.N.'s* #5801 Canadair CL 215. Send $1 for the new 1986 updated catalog.



SUPERTIGRE 60CC INLINE TWIN

Giant-scale has a new engine: Super-Tigre's new 60cc Inline Twin has a 3.6 cubic inch displacement and produces a whopping 5.8 hp at 8,000 rpm. The Inline Twin features a low profile twin cylinder with an opposed firing design that is low on vibration, high on power, and realistic in size. Schneurle porting and four ball-bearings give the 60cc even more power, while the massive aluminum motor mount provides solid support. This engine will give the giant-scale modeler both scale-like appearance and power. The SuperTigre 60cc Inline Twin is distributed to hobby dealers by Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820).



FITZPATRICK .61 ACCESSORIES

Fitzpatrick Engines USA (9016 Wilshire Blvd., Suite 127, Beverly Hills, CA 90211) introduces four accessories to complement their new .61 engines. For the side-exhaust engine, there is a high-quality sportsman muffler and for the rear-exhaust engine there is a rear header for tuned pipes. (It will fit 99% of rear-exhaust pattern airplanes.) There are also two side-exhaust headers for tuned pipes (standard and long). An in-flight needle-valve control system for both engines will be available soon.

CRAFT-AIR CHECKMATE

Craft-Air (6860 Canby Ave., #120, Reseda, CA 91355) announces the release of the Checkmate pattern airplane kit. The unique design allows this ship to compete equally well in the AMA or FAI Turnaround patterns. The airplane will accommodate any rear-exhaust .60 two-cycle engine, or .90 to 1.20 four-stroke engine. Checkmate can be built with tricycle landing gear or as a tail-dragger. Wingspan is 66 inches, wing area is 820 square inches, and fuselage length is 59½ inches. A five-channel radio and six servos are required, as well as retractable landing gear.

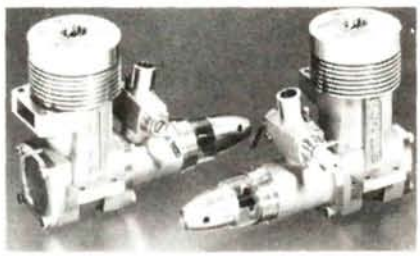
DU-BRO'S FLY'N BUDDY

The Fly'n Buddy Field Box from Du-Bro (480 Bonner Rd., Wauconda, IL 60084) has a sturdy aluminum frame with tempered masonite, a hinged control panel, a folding handle for easy transport, and deep compartments for plenty of storage. With a bolt-together construction and pre-drilled holes, the directions are easy to follow. All screws and lock nuts are supplied. With handle extended, the dimensions are 39x28¾x-14½ inches. It weighs 11½ pounds.

IN-COWL FOUR-CYCLE MUFFLERS

In-cowl mufflers for .61 to 1.20 four-cycle engines are now available from J'TEC (164 School St., Daly City, CA 94014). Easy to install, these mufflers mount flush to the cylinder and are designed to fit *inside* cowls with limited space. These mufflers can be used on upright, inverted, or side-mounted engines. Two models are offered: one with the exhaust tubes pointing down, and the other with a side exhaust tube. Silicone exhaust extension tubing is included with each muffler. Tests show that these mufflers are as quiet as the stock mufflers and, on some engines, even quieter. They also produce smoke very easily. Just install a pressure fitting in the muffler, a smoke fuel tank, an electrical or mechanical pump, and a switch for instant smoke. There are 14 mufflers available.

Descriptions of new products appearing in these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee of performance or safety by **M.A.N.** When writing to the manufacturer about any product described here, be sure to mention you read about it in **Model Airplane News**.



FITZPATRICK .61 SCHNUERLES

Charlie and Mike Fitzpatrick have introduced two new .61 Schnuerle-ported engines for rear and side exhaust. Robust and ruggedly built, each engine is selectively custom hand fit and assembled into a fine FSR-ABC unit, designed for pattern competition and dedicated to the Sunday sport flier. New internal design innovations coupled with micro-precision Computer Numerical Control (CNC) machining and workmanship achieves a high level of reliability and brute torque power. Highly complex aerospace-quality investment castings for both engines ensure 1,000 to 2,000 rpm over the nearest competitors for out-of-sight vertical performance. For more info write to Fitzpatrick Engines USA (9016 Wilshire Blvd., Suite 127, Beverly Hills, CA 90211).

J'TEC POWER STICK

The Power Stick from J'TEC (164 School St., Daly City, CA 94014) is a computer-designed, state-of-the-art "chicken stick." The handle and power rod are one-piece cast aluminum for strength and proper striking weight. It will flip props faster and start engines quicker than any other hand starter. The classic handle is brightly polished and the power rod is vinyl-covered to protect the prop; it will not leave black marks as most hand starters do. The power stick works on any size engine, but it's really great for large four-cycle gas engines.

SNAPIT GLO PLUG CONNECTOR

This lightweight Glo Plug Connector hangs on firmly while the engine is being started. It's very simple to use: just "Snapit" on, start the engine, then "Snapit" off. It won't short or fall off. There are no working parts to break and positive contact gets all the current to the glo plug. Eliminate your glo plug connector problems with the patented "sure-fire" Snapit. Write to Sooner State Spring Mfg. (Rt. 2, Box 197, Chouteau, OK 74337) for ordering info.

ENYA SS 25

The first engine in Enya's new Super Sport Series is the SS 25. It's Schneurle-ported for power and a bronze bushing supports the crankshaft, allowing trouble-free operation. Advanced metallurgy allows Enya to make piston/cylinder match-ups work better and longer. A cast-iron piston is fitted to a nitrogen gas hardened steel cylinder, which results in a high-quality unit producing .63 hp and revs up to 15,000 rpm. Specifications are: bore x stroke, .70x.645 inches; displacement, .249 cubic inches; weight, 7.5 ounces; horsepower, .63; and rpm range, 2,500 to 15,000. See your local hobby dealer or contact Altech Marketing (P.O. Box 286, Fords, NJ 08863) for more info.

HELICOPTER SURE STARTS

High-compression or flooded engines start with ease with Sure Starts from Du-Bro (480 Bonner Rd., Wauconda, IL 60084). Made of aluminum and steel, Sure Starts provide a "no-pressure" starting procedure and alignment can be 20° off center. An adaptor converts all Cone Start Systems to Sure Start Systems. Available now is the Helicopter Sure Start, the Sure Start Insert, the Helicopter Sure Start (Cricket), and the Cricket Sure Start Insert.

KYOSHO JAVELIN

The Kyosho Javelin 4WD is a "roll-cage" version of the popular Kyosho Optima and is designed for the serious off-road racer. The $^{1}/_{10}$-scale Javelin is fast and performs superbly on any terrain. It's powered by a Mabuchi RS-540S electric motor and features an efficient, enclosed chain-drive system. There's a two-gear ratio and a three-speed forward, single-speed reverse speed control unit. The Javelin comes with an aerodynamic rear wing and complete hardware. It requires a two-channel radio, a 6-cell battery pack and charger. The Kyosho Javelin is distributed by Great Planes Model Distributors (P.O. Box 4021, Champaign, IL 61820).

BARNSTORMER

(Continued from page 82)

version narrow band 1991 FM receiver, servo-reversing, and all the other bells and whistles for such a low price. Nevertheless, the proof is in the pudding.

I've flown the system many times at Floyd Bennet Field in Brooklyn, New York. This location is infamous for having some of the most electronically "dirty" air in the country, a true proving ground for the radio.

I've taken the 25L up so high, it was nothing but a red spot in the wild blue, then I flew the plane very far out and very low to the ground, an even bigger no-no. The only no-no's I came up with were no interference, no glitches, no nothing except an apparently very strong link between me and my model. I kid you not, this radio works! I understand Polk's will soon offer a ball bearing servo.

Now what kind of engine do you think I'd put in a model from a barnstormer series? Of course—a four-stroke. The Webra T4-40 you see in the photo is the latest version. The carb has been moved to the back, even with the backplate, which is much better for lining up with the tank, and the exhaust is also more conventionally located on the side.

The Webra four-strokes all have a horizontal cylindrical rotary-valve instead of poppet valves. You never need to worry about valve float with this setup, so normal four-stroke rpm limits don't apply here. Although not the most powerful engine in the .40-.46 size, the T4-40 did show good power, particularly on smaller props such as a 10x7. The T4-40 was, however, top drawer when it came to handling qualities and idle (2,200-2,400 rpm) and has impeccable throttle response from a dead idle to high speed.

So far I've had no dead sticks due to flame-outs. The little engine responds instantly to the electric starter or only took a couple of flips by hand, after choking, to come to life.

Other pluses are low weight (13.4 ounces with muffler) and simplicity (only three moving valve train parts). All tests were done with a Jo-Z (Zingali) four-stroke plug, which seems to work very well with four-strokes. The entire Webra line, including parts and service, is exclusively handled by United Distributors*, an authorized U.S. distributor. For further information contact Jerry Goertige at the address listed at the end of this article.

FLYING. And now for the fun part. The Webra came to life immediately with the first touch of the electric starter. The 25L has no steerable tailwheel but the addition of one would be a simple matter.

I set the model on the grass and let her rip. The 25L with its vintage wheels handled the rough grass very well. This setup is a bush-pilot's dream come true. The 25L climbed out in a very stable, predictable manner. It did become apparent the model was a little too nose-heavy, making the elevator less effective than desired. Since the 25L will fly well, and balance correctly with a lightweight .20-.25 two-stroke, the .40 four-stroke did make the model slightly nose-heavy. Instead of adding tail weight, I moved the battery pack behind the servos. Subsequent flights of the 25L brought no surprises.

As expected, the symmetrical turbulated airfoil remains effective right down

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BARNSTORMER

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to a veritable crawl. There was, however, a very welcome surprise in store for me. Unlike other models I've had with this type of "lifty" and forgiving airfoil, the 25L will snap-roll and spin on command. Why the model does this while retaining its low speed, trainer-like properties, I've not yet ascertained. Any theories are certainly welcome.

Outside maneuvers were also quite good, with inverted flight being a forte with only slight down-elevator needed. Knife-edge did require a bit more down-elevator to keep on a straight line. All in all, the aerobatic capabilities of the 25L were an unexpected plus.

So if good looks, simple construction, and a downright cheap price tag sound as good to you as they do to me, the 25L from RPM is the answer.

Oh yes! If you cover this bird with anything except one of the translucent films, personally I think you're nuts!

**The following are the addresses of the companies mentioned in this article:*

Varicom Industries, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Pacer Tech, 1600 Dell Ave., Campbell, CA 95008.

Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, IL 60084.

Polk's Modelcraft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304.

United Distributors, Jerry Goertige, 301 Holbrook Dr., Wheeling, IL 60090. ■

CONTROL TOWER

(Continued from page 76)

is for oil-base paints or metallic enamels.

Rounding out the system is an 8-foot air hose and an HS 802 bleeder valve for use with non-bleeder airbrushes. I've used this spray unit three times for two R/C cars and the trim on a new R/C airplane. I think it's great and if you're in the market for spray equipment, consider W.R. Brown.

Another neat item from W.R. Brown is the HS 342 Mini-Blaster. Uses for this miniature sandblaster are as many as your mind is fertile. My immediate thought was that it would be great for weathering scale models, from plastic to ¼-scale. The unit employs an airbrush-type gun designed to pass 220-grit silica sand or aluminum oxide type abrasives. Needless to say, you must take precautions when using this tool. Use it in a well-lighted and ventilated room and use a fask mask, gloves, and safety glasses.

Place the object to be sandblasted on a clean paper or in a box so that the expended abrasive can be gathered up, filtered (220-mesh screen), and reused. Other uses for the Mini-Blaster include paint or rust removal, general cleaning, and glass etching. The HS 342 comes complete with sandblast gun, 4-ounce jar, 8-foot air hose, face mask, and 12 ounces of 220-grit aluminum oxide.

Write W.R. Brown for a catalog. I'm sure you'll like their products, I know I do.

My next goodie is the High Point Products* Multi-Use Precision Balancer seen at the recent WRAM Show. To start, I must say that this balancer is a precision instrument and should be treated as such. You must handle the side assemblies and the balancing spindle with care. Let me highlight some of its features:

- Excellent accuracy.
- The balancer doesn't need to be leveled.
- One balancing shaft will fit prop holes from ⅛ inch to ⅜ inch diameter.
- Centering cones can be utilized to balance thin objects, such as spinner back plates.
- Extension legs are available to balance up to 24-inch diameter props.
- Props, spinners, ducted-fan rotors, boat props, and wheels can be balanced.

High Point describes the best way to use the balancer as follows:

"Mount prop to be balanced on balancing shaft between centering cones. Slide movable centering cone against prop and fixed centering cone. Place shaft on wheels of balancer and rotate prop, if prop rocks back and forth, it indicates there is a heavy side. When rocking stops, the heavy side will be down."

Balance carefully by removing material from the down side or add weight to the other side. My experience has shown that a slight sanding on the heavy side is usually enough. On the Zinger prop I used, a few swipes with 200-grit sandpaper on the heavy side was enough to balance the prop. The prop balancer sells for about $24 and I recommend it.

Last but not least are a couple of new

four-cycle props also seen at the 1986 WRAM show and manufactured by Dynathrust Props* of Pompano Beach, Florida. President Ray Collelli gave me a couple of 14x6 props to try with my new Enya 80 four-stroke. Ray pointed out that in addition to the Dynathrust logo on the prop front, white tip stripes have been added for safety. I used the aforementioned prop balancer to complete balancing after removing the mold flashing from the props with a No. 11 X-Acto blade and light sanding. Final balancing was effected using 600-grit sandpaper.

Next month I'll review another new six-channel system with a dual conversion "1991" receiver.

Charlie Kenney, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Jomar Products, 2028 Knightsbridge Dr., Cincinnati, OH 45244.

W.R. Brown, Inc., 2701 N. Normandy Ave., Chicago, IL 60635.

High Point Products, 3013 Mary Kay Lane, Glenview, IL 60025.

Dynathrust Props, Inc., 2541 N.E. 11th Court, Pompano Beach, FL 33062. ■

after the test flight on Friday because it lacked performance. After changing the 12x6 prop he had on the .60 to an 11x7½ I gave him, his frowns and mutterings changed to big smiles and enthusiasm.

Eldon Wilson of San Angelo, Texas, arrived with two F4F Wildcats. One is done up as the Confederate Air Force Wildcat, even down to the name of the CAF pilot, Col. Gerald Martin, on the side of the fuselage. For several years Gerald flew the big one for the CAF in airshows all over the country. One of the world's top pilots, he's also one of the best R/C pilots in the country.

Dennis Crooks, all the way from Big Rock, Illinois, came to the fly-in early to practice. And it paid off because his P-40 was sure looking good. But he saved the best for last. His magnificent, scratch-designed TBM taxied out with wings folded, then they unfolded and locked while the plane was moving, then turned onto the runway heading and made a long, straight, smooth takeoff. It has to be seen to be fully appreciated. Of course, he folded the wings while he was taxiing back after landing.

Many of the pilots and spectators in the large crowd liked the performance also because Dennis was awarded the coveted "People's Choice" award. Three weeks later he won Best of Show at Toledo with the same airplane.

Guy Lane was up to his usual standards putting a 1/3-scale Laser through lots of fine aerobatics while flying slowly with a chugging engine; that's hard to do! For a change of pace, he switched to his F-16 and wowed us all.

Certainly one of the best fliers around is Lewie Kear from Phoenix. He proved it again this year by putting his 18-pound Quadra 35-powered Nosen P-51 through its paces; I doubt he ever got more than 75 feet high.

Speaking about one of the best pilots around, old "Mr. Consistency," Kent Walters, knocked some more paint off the runway center stripe with the bomb from his veteran (and still magnificent) Dauntless. It seems like he's diving from ever higher altitudes but that bomb is still right on target.

I'd like to point out that the 1/8th Scale Fly-In is definitely not limited to, nor just for, the "big guys." To prove this point, my latest student, Glenn Overlander of Albuquerque, flew his first scale plane, a

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1/8TH AIR FORCE

(Continued from page 53)

Can you imagine having two of these? Better yet, can you imagine someone else being there with one? Well, Bud Wolfe was! John and Tony were saving their big 10-foot B-17 for Saturday and Sunday. They've been flying this B-17 for two or three years and have a ball with it. It's a great crowd pleaser. On the first flight Saturday, Tony lost the right fixed landing gear when he skimmed the dirt as he went off the runway on takeoff. He just flew it around in majestic circles with some neat low passes and fly-bys. He even did a one-wheel touch-and-go.

By the time he decided to land, the inboard left engine had quit—no problem; Tony just eased her down on the left main gear, held the right wing up as long as he could, and then let nature take its course. Just as graceful and pretty as could be the B-17 pivoted around the dragging right wing tip and came to rest, still on the runway, after turning almost completely around. Everyone gave a big cheer.

Chuck Collier completed his Zlin on Thursday night. He wasn't very happy

1/8TH AIR FORCE

(Continued from page 101)

Goldberg Cessna 182, all three days. And this was his first participation in any kind of meet. The same goes for Chuck Andraka, also from Albuquerque, who flew his brand new Pica T-28. Big smiles and enthusiasm are their answers to the question "did you have a good time?"

Under the able direction of Tamas Torok, the banquet planning and execution went perfectly. Because of the completely informal and partially outdoors eating setup, we could go directly from the field to the banquet. This allowed flying almost until dark for those so inclined.

That classic comedy team of Al Casey and Bob Frey got together and did it again. The whole show was fast-paced and hilarious with Al singing "Flying," a parody of Roy Orbison's "Crying," which brought the house down. Reports are that Roy and Benny Birchfield, who came to spectate, led the cheering.

The 1/8th Air Force Scale Fly-In officially ended at 3:00 p.m. Sunday so out-of-towners could start home early. However, those who had to leave early missed the *piece de resistance*; the flight of Jerry Kikkert's huge, 105-pound, 1/4-scale F-82 Twin Mustang, the Betty Jo. (Because it was over the AMA weight limit, it could not be flown during the official fly-in.)

The two Quadra 82s were quickly fired up and checked out, then pilot Billy Hempel made a picture-perfect takeoff, followed by some inspirational low flybys, both upright and inverted. Having Col. Bob Thacker present for the flight was the icing on the cake. Bob set a world's record in the Betty Jo by flying it non-stop from Hawaii to the U.S. East Coast.

Thus another 1/8th Scale Fly-In was history. The outstanding flying of beautiful scale planes combined with a bunch of fine people, perfect weather, and top-notch facilities again convinced me that this is the best scale get-together, bar none. ■

ACROSTREAK

(Continued from page 23)

Cut a slot in the bottom of the wing where shown, and insert F-4. *Do not* attach F-3 yet.

Now affix the 3-inch reinforcing cloth

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Four-Cycle Forum

by ELOY MAREZ

FOUR-STROKENIKS, gather around! As our last episode ended I was just about to take off for Toledo and, as promised, here is some four-cycle news I ran into there.

The first bit of excitement was at the Altech Marketing* booth, where I saw Arnie Brodsky. Altech is the company that brings us the excellent line of Enya engines. Their R120-4C needs no introduction, I'm sure, because it's pretty well established as an extremely powerful engine. For those of you who missed it, there's a review by Peter Chinn in the July 1985 issue of *M.A.N.* Take a look at the photo of the Twin Vee 120—doesn't that make you start looking for airplane designs?

The Enya Twin Vee has a total displacement of 2.4 cu in. It has a bore and stroke of 31.0x26.4 mm respectively, and weighs 700 grams, about 24.7 ounces. It's an alternate-firing design, and is supplied with the necessary glowplug wiring and attachments. A specially-designed mount is also provided.

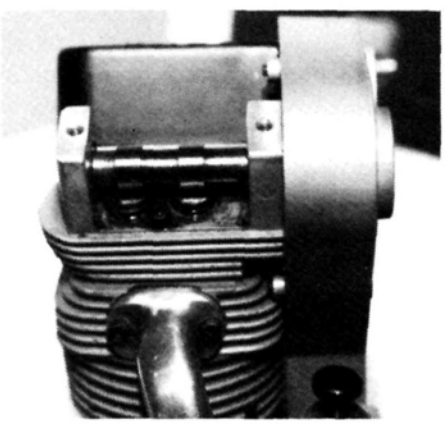
Performance-wise, the Enya 240 is rated from 6,000 to 11,000 rpm, with an idle speed between 1,800 and 2,000. Recommended props, depending on the airplane, are from 16 to 20 inches, with 6- to 10-inch pitches. With an 18x6 prop, the speed is claimed to be 8,500 to 9,000 rpm.

Altech said this engine would be available in late summer. I don't have a price at this time, but check the ads. If I get any advance word, I'll share it with you.

There was good news and bad news from Downey, California. The good news is that Bobby Tom and Bill Wisnewski of K&B Manufacturing* let me see their new DOHC Four-Valve 1.20. DOHC stands for Dual Overhead Cam, details of which you can see in the photo. Notice that there are two intake and two exhaust valves; this arrangement increases the area that opens during that part of the cycle. This increases the volumetric efficiency of the engine; that is, it breathes better, resulting in increased power. The same results could be obtained with larger valves, but the size of the heads doesn't always allow for them, four valves is a very workable scheme. In fact, a four-valve engine is used in the 1987 Toyota Supra automobile.

The Enya Twin Vee-120, distributed by Altech Marketing, has a total displacement of 2.4 cubic inches and weighs 24.7 ounces. It is an alternate-firing four-stroke.

K&B Mfg. is developing a four-stroke 1.20. See text.



K&B's engine is a dual overhead cam design with two intake and two exhaust valves.

I can tell you more about the kind of thinking that went into this impressively designed engine. The valves incorporate another power-adding feature: the exhaust valves are larger (3/8 inch) than the intake (7/16 inch) and the valve cams are operated by a covered, rear-mounted timing belt arrangement.

The engine weight is 38 ounces and the performance claimed on a 14x8 is 11,500 rpm.

And now the bad news—they won't be available until 1987. The price was stated as being "competitive."

The only other news from the city on the banks of the Maumee River is that there has been some reshuffling among who imports what brand of engines. This doesn't greatly affect things down at the retail level, but it does seem to have an effect on service and spares; something that can be more critical with the mechanical complexity of the four-cycle engine. Therefore, I recommend that before you purchase that new four-stroke, you check to determine who now brings that particular engine into this country and check on parts and service.

Isn't it going to be great to have a "Made in America" four-cycle engine at last?

New Giant-Scale Index

Did you notice how readily I was able to tell you where to look for the article on the Enya R120-4C? Well, that's because I have an index. It's called the "Giant Scale and Large Engine Directory Reference Guide to *Model Airplane News,* 1975-

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ACROSTREAK

(Continued from page 104)

to the center section using your favorite adhesive. I prefer 5-minute epoxy thinned about 25% with lacquer thinner. Notch out the front of the center section and add F-3 and the filler piece you cut off the fuselage earlier. Place the wing on the fuselage during this time to ensure a good fit. Finally, insert the ¼-inch hold-down dowels.

Refer to the wheelpants exploded-view diagram and cut center pieces from 1x2x6-inch light balsa blocks. Cut out two 1/16-inch ply mounting plates. Cut out four 1/16-inch balsa sides, with the same outer outline as the center piece but without cutting out the wheel area. On two of these sides, trace the mounting plate outline in the location shown on the plans, and remove this area. Attach the two sides to each center piece and insert the mounting plates. Be sure to make one left and one right. Now taper and round them off to a typical wheelpant shape.

Open up the front right side of the fuselage to accommodate your engine. Put holes below the engine as necessary for vent lines, choke extensions, etc.

Install the maple wing hold-down blocks into the fuselage. Mount and align the wing, and drill and tap through the wing-bolt reinforcing plate for ¼-20 bolts.

With the wing in place, attach the stabilizer and fin to the fuselage, aligning them with the wing. Place a small epoxy fillet under the stab where it joins the fuselage, and at the base of the fin where it joins the stabilizer.

Select your landing gear, bearing in mind that weight savings is important. Cut out the center section of your gear to fit the rather slender width of this fuselage, and attach it with sheet metal screws. Sand a V shape on the front of all control surfaces and slot them for hinges.

On each aileron, cut a ⅛-inch deep slot where shown on the plans and insert a ⅛-inch ply control horn support, securing it with epoxy. This allows the control horns to be mounted with small wood screws, and leaves the top of the ailerons unblemished.

Construct the tailwheel assembly as shown. Cut a small slot in the rear of the fuselage to accommodate the bracket. Drill and slot the hardwood insert in the rudder to fit. Remove the main landing gear and tailwheel assembly.

To cover, brush some Balsarite over the epoxy fillets on the tail. Cover the entire aircraft with MonoKote or a similar iron-on covering. Cover the wheelpants in a complementing scheme. The wheelpants area is a little more difficult to cover, but can be done with a heat gun and a little work.

Fuel-proof all exposed areas, including the fuel-tank cavity and inside of the wheelpants.

Secure the engine to the Dave Brown 40-45R mount and fasten it in the fuselage. Install a 6- or 8-ounce fuel tank by packing it firmly with foam in the fuel tank cavity. Note that the tank will extend into the radio compartment an inch or two. Be sure it clears the wing.

Place the servos in the wing and arrange the remainder of the radio in the fuselage to achieve correct CG.

Use a fiberglass pushrod for the elevator with a V connection on the end and a control horn on each elevator. Use lightweight cable for a pull-pull connection on the rudder. Set up the control throws as follows: ailerons: ¼ inch up and 3/16 inch down; elevator: ½ inch up and ⅝ inch down; and rudder: 2 inches each way.

Check the CG again and the side-to-side balance. It will usually take a good size nail or two in the wing tip opposite the engine to offset the weight of the four-stroke.

FLYING. Take some props of various sizes with you to the flying field so you can decide which you prefer. On the Enya 46-4C from Altech Marketing*, a 10x8 will give you a fast, very responsive aircraft in the air but has a tendency to float a bit on landing due to the high pitch and relatively high idle. An 11x6W will give a noticeably slower airspeed, but still very good aerobatics and a slower landing speed. It will even climb steeper with the 11x6W because of the larger thrust area, and this is important in fun-flies.

In a typical flight I might takeoff, fly the entire FAI Turnaround pattern, practice a few touch-and-go's with a Lomchevak or low inverted pass in between; then perhaps climb up a few hundred feet, shut down the engine, leisurely glide around for a while and then land, trying to end up as close to my feet as possible.

Don't be concerned about a possible lack of inverted flight capabilities because of the semi-symmetrical airfoil. With the differential in the elevator (more down than up) you'll barely notice a difference between right side up and upside down. It takes very little elevator to hold it inverted and outside loops are performed with ease.

Adjust the elevator and rudder throw to get a good snap roll and spin. You'll find it's very positive in this respect. The

Acrostreak will knife-edge from one end of the field to the other (with either prop) by holding about two-thirds of the rudder and a slight bit of opposite aileron to compensate for the high wing location.

If the engine quits in flight you'll be pleasantly surprised because gliding is the Acrostreak's specialty. You'll have plenty of time to set up for landing and you won't have to worry about going too slow; it won't tip stall. It will just mush straight ahead, even with full up-elevator.

Enter the Acrostreak in your local fun-fly but be sure you have enough room on your shelves for the trophies you'll be bringing home!

**The following are the addresses of the companies mentioned in this article:*

Carl Goldberg Models, 4733 W. Chicago Ave., Chicago, IL 60651.

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220.

Altech Marketing, P.O. Box 286, Fords, NJ 08817. ■

FROM THE COCKPIT

(Continued from page 68)

thumbwheel on the stick in a tight turn to give the airplane more lift and make more G available to it.

As long as I'm talking lift control, I might as well get deep into the Tomcat's DLC system. DLC means "Direct Lift Control," which sounds redundant considering what I just finished discussing, but it's not. The DLC system uses a set of wing spoilers that, when activated, deploy to a "neutral" position of +5°. These spoilers are hooked directly to a thumbwheel on the stick, which allows the pilot to vary their setting infinitely from a 0° position to as much as 15° deployment angle. This gives the pilot the capability of moving the airplane vertically up and down, when flying final approach, without touching the power or changing the airplane's attitude. When DLC is engaged and the autothrottles are cooking, the pilot can bring the F-14 onboard a carrier as if it were on wires.

As neat as it sounds, the DLC was at the center of a heated debate between Grumman and the government. The contract called for an airplane capable of doing 2.4 Mach (something in the neighborhood of 1,800 mph!), yet it still had to come onboard ship at 147 mph! The airplane could do it, but not with DLC working because that added another 7 mph. That might not sound like much, but the government isn't known for applying logic or a "close-enough" approach to the requirements it hands out to its contractors. It held Grumman to the number and it took a bunch of test pilots a bunch of long nights working out procedures that would satisfy both the government and keep Grumman out of the doghouse.

Of course, the F-14 nearly bankrupted Grumman anyway. The F-14 was one of the very first "fixed contract" acquisitions, so Grumman was stuck with the price they bid and there were no easy ways around that price. Inflation nearly ate them alive, but not as much as the unknowns involved in building an airplane like this.

Grumman had built one of the very first swing-wing aircraft, the F10F Jaguar, in the 1950s, but the airplane was never produced. More recently they had great experience in swing-wing designs because of their deep involvement in the F-111 project. But the F-14 was breaking new ground in a lot of areas, many of them in the airframe structure itself. Gaining the absolute maximum performance meant keeping the airplane light, which ain't easy when you're trying to do twice the speed of sound, carry half the computers in the free world, push the package with two 20,000-pound thrust blow torches, and then expect to be able to repeatedly pull 8 Gs. So, Grumman was forced into inventing many structural concepts and procedures. Much of this innovation involved using more titanium in the airframe than had ever been done before and using new ceramic technologies that had never been applied to aircraft. They were making up the rules as they went along.

At least one of the new ideas didn't work.

On the second flight of the first prototype, the airplane reportedly lost all hydraulic pressure, which meant they had to depend on a small auxiliary pump for control. Unfortunately, on final, the airplane went out of control and crashed, but not before both crew members punched out and landed unharmed.

After you've attended a zillion airshows, they all tend to blur together. However, certain incidents will always stand out clear and bright. One of those for many will be the sight and sounds of a low level show done by an F-14 Tomcat. In the first place, the airplane is huge, really huge. In the second, even though we've had a swing-wing, twin-tail, bigmother Air Force and Navy for some time, an airplane like an F-14 still looks like something Luke Skywalker should

be flying. On takeoff, as the pilot selects zone-five afterburner, the ground beneath your feet actually quivers and the smarter among us drop everything and put their fingers in their ears to prevent damage.

But that's the believable part. The part that stretches the credibility of our own vision is watching the airplane break ground in 1,200 feet, suck up its gear, and then pull up into an Immelman. Or simply disappear from sight straight up.

I was assigned to shoot photos of the F-14 undergoing operational testing at NAS Pautuxent River in the early 1970s and I experienced one of those credibility stretchers myself. I had stationed myself at the side of the runway, next to the end of the carrier type catapult that is part of Pax River's test equipment. An F-14 sat at the far end of the cat track, barely a block away and still looking as big as a house. The cat officer dropped his hand and the F-14 shot toward me. In less time than I could focus my thoughts, the Tomcat was off the runway and was at least 50 feet high at the end of the cat track! The experience was so surreal that I had forgotten to even raise my camera.

I swung around to watch the airplane, which in nano-seconds had pulled up into a vertical climb. I was conscious of looking upward with my tongue drying out in my open mouth as contrails formed behind the airplane and I watched them arch up until I couldn't make out the airplane at the tip any more. All of this took only a very few seconds, and then I heard the pilot's voice over the radio announce, "Bingo. There's 15,000 feet and I'm still over the runway intersection." Even he was amazed and he was having a helluva good time.

Before the flight, while BSing with the pilot, I asked him what would happen if the wing were to be stuck full back in flight and he couldn't unlock it. He said he'd landed with it part way back, but the only way to find out what would happen with it all the way back would be to try it. So, as the test airplane turned final to the concrete carrier (complete with arresting cables) the image it presented was one of a bat with its wings tucked in its pockets. And it was really hauling (later he said about 225 knots). He smacked down on the deck, catching number 3 wire just like he was supposed to, and came to a lurching halt. So much for the question of locked wings!

At 15 years of age, the Tomcat has the new children of technology tugging at its reputation. The controversial F-18 Hornet is the new kid on the Navy block and the guys across the way have newer MiGs and Sukhois. Fifteen years is a long, long time in the technological environment of the 1980s. But the Tomcat is hanging in there. No, it's more than hanging in there; the Tomcat is still considered by those who know it to be one of the most reliable, most effective weapon systems available.

Just as the A-4 Skyhawk is still soldiering on having passed its 30th birthday, we'll undoubtedly have Tomcats prowling the seas for decades to come. ■

4-CYCLE FORUM

(Continued from page 105)

1985." It's a handy guide for those of you who are always thinking, "I remember reading about that somewhere!" The guide is compiled by Lou Guerrieri and includes not only giant-scale but many related subjects, such as all the engine information you've read here during the above period. It's a real time-saver and I recommend it to all of you who are serious about our hobby.

The loose-leaf directory is $6.95 and is available, along with information on similar directories, from Glideline Publishing*.

More Tachometers

Last month I discussed tachometers in general and what I consider their value in helping you to overcome your two-cycle ear and in helping you adjust your four-cycle engine in a manner that will allow it to develop all the power of which it is capable without also damaging itself due to improper, read *lean*, carburetor settings. For you serious fans, there's one more step to consider: measuring the airborne performance of your favorite four-stroker.

Thanks to modern-day electronic technology, it's now possible. It's called a Tele-Tachometer and it's like an R/C system in reverse; the transmitter rides in the airplane and the receiver stays on the ground. The similarity ends there, though. This transmitter is about the size and weight of a servo, while the receiver looks exactly like a tachometer in all respects. It should, since that's exactly what it is, except that the sensing is remoted and transmitted via a radio link.

The Tele-Tach provides in-flight engine rpm in readings in three ranges: 0-3,000, 0-15,000, and 0-30,000. But that isn't all, it can also provide aircraft speed in two ranges, up to 150 and to 300 kilometers per hour. Don't let that turn you off, conversion to miles per hour is relatively easy. All you have to do is multiply by .6 and you have a reasonably accurate figure.

You'll pardon the slight deviation from the subject of four-cycle engines, but I think the ability to read airspeed while in flight is extremely interesting and can be valuable when you're experimenting with fuel or props.

Anyway, I've done extensive flying with the Tele-Tach installed in an O.S. FS-61-powered Telemaster, the big one. At half open throttle, the Telemaster

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4-CYCLE FORUM

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burned up the airways at 32 mph. At full throttle, it would nudge 33 mph, and straight down at full bore, it would sometimes reach 34 mph. I do believe we overestimate the speeds at which our airplanes fly!

Another interesting feature of the Tele-Tachometer is something that I consider to be the real frosting on the cake. It has a low reading audible warning, which can be set to let you know a critical value has been reached. On the airspeed function, I have it set as a stall warning. It works just like a stall warning on full-scale birds: throttle back, pull up the nose, and just before the nose starts to fall, the Tele-Tach will start to beep. I love it!

For the technical minded, the airborne portion of the Tele-Tach includes two sensors which are switch selected with a servo. You can also do the selection manually but, of course, only while you're on the ground. The rpm sensor is the normal optical pickup as in the usual hand-held tachometer. The airspeed sensor is actually a little propeller whose speed increases with airspeed and whose rpm is measured by another optical pickup. The reading is then converted into kph.

It works for me and I found it to be not only interesting, but instructive. The Tele-Tachometer, manufactured in Japan by the Digicon Company, is imported by AYK Racing USA*. Write to them for further information as well as the current price.

Eloy Marez, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Altech Marketing, P.O. Box 286, Fords, NJ 08863.

K&B Manufacturing, 12152 Woodruff Ave., Downey. CA 90241.

Glideline Publishing, Lou Guerrieri, 228 Windsor Dr., San Carlos, CA 94070.

AYK Racing USA, P.O. Box 3479, Mission Viejo, CA 92690. ■

HELICOPTERS

(Continued from page 40)

This will cause differential lift on the rotor disk making the helicopter move to the right, left, forward, back, or a combination there of, depending on the control input to the swashplate.

The Hiller control system is very precise and the control force is very strong placing low loads on the servo, but since it's an indirect system it's slow; producing a noticeable lag in control response time.

The Bell-Hiller system combines elements of Bell's original system, which only uses direct input to the main blades, and the flybar from Hiller's system. In the Bell-Hiller system the rotor blades receive their inputs directly from the servo and indirectly through the flybar, providing both speed and power to the main blade control.

Collective pitch control is handled in several ways by different manufacturers. It can be accomplished either by a sliding bearing with a pushrod or by sliding the whole swashplate. In the sliding bearing method a collective lever slides the bearing on the main shaft. A pushrod is connected to the inner race which runs in a groove on the main rotor shaft and connects to both blade holders through a series of links. In the sliding swashplate method the whole swashplate moves up and down, moving both blade pitches up or down.

The engines used in model helicopters are the same as those used in model airplanes. Some manufacturers have added a heat-sink head to facilitate cooling, but there are no real differences. Schnuerle-ported and ABC engines are most often used in helicopters because they have a high power-to-weight ratio. Engines in helicopters must be 100% reliable. They must idle well and accelerate smoothly and linearly to full power without hesitation.

Carburetor adjustment is very critical. I know from personal experience that having an engine that doesn't function properly is one of the most frustrating problems that can plague a model helicopter.

Since helicopters have no prop air blast to cool the engine, most machines have a fan mounted on the engine and a shroud to blow cooling air over the cylinder head. A centrifugal clutch is mounted on top of the fan. The main gear is driven either directly from a pinion gear on the clutch bell or by a toothed belt. The gear reduction ratio of most machines is about 8 or 9:1.

Engine starting is accomplished either by a belt or by a tapered cone on the clutch shaft. Some helicopters are equipped with an autorotation clutch. It's usually located on the bottom of the main shaft in the main gear. This clutch is a one-way drive point which will allow the main rotor to spin independently of

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the remainder of the system mechanics, minimizing frictional losses for engine-off landings.

The tail rotor is a smaller, simpler rotor used to counteract the torque generated by the engine and main rotor. It must match this torque and also be able to make the model's fuselage move to the left or right. The tail rotor power is transmitted from the main gearing to the tail either by a music wire rod and a right angle gear box, or by a toothed belt. The tail rotor speed is at a constant ratio to the main rotor speed. The amount of thrust the tail rotor generates is varied by changing the pitch blade. The tail rotor pitch mechanism is much simpler than the main rotor. It consists of ball-bearing-supported blade holders and a pitch control plate which moves both blade holders simultaneously.

The remote control systems used for helicopters must have at least four or five channels. A standard four-channel radio can be used for fixed-pitch machines or for collective-pitch machines equipped with a mechanical tail rotor mixer. Most of the collective-pitch helicopter kits on the market today don't have an option for a mechanical tail rotor mixer and need a "helicopter" radio. Helicopter radios incorporate an electronic tail rotor mixer or ATS (Automatic Tail Rotor System). Most of these radios sport many other whistles and bells to facilitate set up, trimming, aerobatics, and inverted flying. Helicopter radios use five channels: ailerons, elevator, rudder, throttle, and collective pitch. The throttle and collective pitch channels are controlled together by the throttle stick. These radios also have mixing and end-point adjustments for set up and trimming. The channels can be uncoupled or have their relationship modified in flight for certain aerobatic maneuvers.

Almost everyone who flies an R/C helicopter uses a gyro stabilizer on the tail rotor control. Gyros are legal in competition so all contest fliers use them. The gyro plugs in between the receiver and the tail rotor servo, senses movement about the yaw axis, and sends a signal to the tail rotor servo to counteract the movement. The gyro will not totally control the tail for you, but it will slow down unwanted movement considerably. There are several gyros on the market. Some have extra features, such as in-flight sensitivity adjust or the ability to turn the gyro on and off in flight.

Since most helicopters use five servos and a gyro there's an enormous drain on the battery pack and, as a result, a standard 500-mAh battery only lasts for a few flights. Most radio manufacturers recommend using a 1,000- to 1,200-mAh pack in a helicopter.

The following is an excerpt reprinted from the National Capitol R/C Helicopter newsletter written by Joe Lawrence. Joe has been flying helicopters for 12 years and is very well aware of the questions asked most frequently by beginners. It was Joe who helped me get started in R/C helicopters:

Q. What is the best helicopter to buy?

A. That is probably the biggest question to answer. The decision is yours and yours alone. All helicopter models manufactured today will fly well when assembled and set up properly. This is where the problem comes in. Some are easier to assemble, but do not perform as well as others that are more difficult to assemble. Some types will have design differences that you might feel you can't handle, while other people find them no

HELICOPTERS

problem at all. Each type has advantages and disadvantages and you must weigh the facts and find your answer.

You should have decided four things before you plunk down hard-earned cash: 1) The amount of money that you are willing to spend and what that purchase includes. 2) The size of the machine you want to fly. The size of the engine usually tells you the size of the helicopter (.20, .40, .60, etc.). 3) The expected performance, stability, and aerobatic capabilities. 4) Most importantly, availability and price of repair parts.

Q. Can I learn to fly an R/C helicopter by myself?

A. There have been very few people who've purchased a helicopter kit, opened the box, assembled and set up the kit, and successfully taught themselves to fly. You'll need help either over the phone or in person from someone who can teach you the basics. Most of the time a lot can be gained just by observing how another person chose to assemble and set up his machine. The best advice I can give you is to have an open mind, read everything you can, and get together with other pilots to share experiences.

Q. How long does it take to become a proficient R/C pilot?

A. That depends on your mechanical abilities, how often you can practice, and how truly devoted you are to R/C helicoptering. I'd say that the average person with the type of helicopters we have today should be able to hover reasonably well in about two months. This depends on how well you learn to set up your helicopter, how much time you spend making repairs, and if you practice often. The flight setup of R/C helicopters is more than 50% of learning to fly, and flying a machine that is improperly adjusted teaches only the art of repair.

Q: Should I buy a fixed or collective pitch helicopter?

A: In the last few years there has been a big move from the fixed pitch helicopters to collective pitch. This is due to simple designs that cost a little more and are very reliable. Collective type systems introduce problems in control that the recent "helicopter" radio units solve easily. The use of fixed pitch systems is still very popular and they are much simpler to build and maintain. They do not require the more expensive helicopter radios and can be operated with almost any type of radio control unit. The answer to this question lies in the amount you want to spend and flight characteristics you desire.

Q: What is the best radio to purchase?

A: If you want simplicity and don't want to invest in a new radio, I suggest a fixed pitch helicopter or one that has collective with a mechanical tail rotor mixer and any reliable four-channel radio. If you think you want to become involved with contests or aerobatics, invest in a helicopter radio. Today's radios have more controls than most of us know how to use. Many adjustments can be made from the transmitter and controls can be mixed or compensated for with the flip of a switch or the turn of a knob to give you the best possible performance from your machine.

Q: Should I purchase a helicopter with autorotation capability and will it save me from crashes?

A: The first thing you need to know is that nothing will save you from crashing except experience. Autorotation is a maneuver like a loop or a roll. It takes much practice and in most cases many hard landings before a person can successfully perform autorotations. It is a judgement maneuver that comes from experience and practice. I find that the only time an autorotation can help is when the pilot has practiced this maneuver many times and the conditions for the autorotation happen to be right. It is a good thing to practice but is a long way off for the beginner and I do not recommend that this be one of the bases for determining what type of machine to purchase.

Q: Should I purchase a used helicopter?

A: I don't see anything wrong with a used helicopter. When we crash a model helicopter, the repairs consist of straightening parts if possible and replacing others. If a machine has crashed 100 times but new pieces have replaced the damaged parts then the repairs are essentially "as good as new." The only place where you can go wrong is worn bearings that can fail later or a few ball links that can come loose. You can tell if a machine is a good buy if it is clean and tight in general appearance. Pull on movable parts and wiggle others to see if they are loose or worn. Remember, before you buy you should have in mind that this is the helicopter that you want to own based on decisions made from the above questions and answers.

Those were some good answers by Joe to some of the common beginners' questions. Since Joe formulated his answers there has been one significant addition to the field of R/C helicopters; the ARF

(almost-ready-to-fly) kits. The Hirobo Shuttle is a .28-size machine which comes preassembled. It needs only to have the radio and the engine installed. It features Bell-Hiller mixing and autorotation. However, the best features of the Shuttle are its reasonable price, low-cost replacement parts, and its good flight performance.

Well that's all for this month. Next month I'll discuss building, setup, and training gear. ■

ENGINE REVIEW

(Continued from page 37)

rotated. This is achieved by means of a pivoted forked lever mounted on the outer end of the barrel. The lever is fitted with a small roller and this rides on a steel wire ramp attached to the carburetor body. As the throttle is closed, the lever is forced outwards, causing its forked portion to move against a shoulder on the spraybar, sliding it inwards over the valve needle to reduce fuel flow.

The two ends of the wire ramp are bent over to fit into holes passing transversely through the carburetor body. The amount by which each end projects into its hole (and thus the angle of the ramp) is controlled by headless set-screws inserted in the opposite ends and adjustment is then locked by two more headless set-screws inserted at right angles through the carburetor body.

The carburetor has a choke bore of 10 mm which, after allowing for the spraybar, gives an effective area of just over 30 sq mm.

IGNITION SYSTEM. In the modern manner, the FK-50's ignition system dispenses with the mechanical make-and-break timer (a frequent source of starting problems with early model spark-ignition engines) and uses a breakerless electronic system. The coil and associated electronics are contained in a sealed plastic case that is intended for mounting on the firewall and comes equipped with two screened high-tension leads with special screened connectors for attachment to the NGK ME-8 ¼-in. spark plugs supplied with the engine.

The ignition circuit is magnetically triggered, using two Hall Effect pickups, one for starting; the other, advanced 15 degrees for normal running, being brought into operation by a microswitch actuated by the throttle arm on the carburetor. The magnets that trigger the system are installed in a plastic disc

recessed into the rear face of the camshaft gear.

The camshaft, of course, rotates at half crankshaft speed and two magnets, 180 degrees apart, are used in order to provide a spark for every crankshaft revolution, since the engine is an alternate firing twin. In fact, a spark is supplied simultaneously to both cylinders for each crankshaft revolution. This means, of course, that one spark, occuring towards the end of the exhaust stroke, rather than the compression stroke, is unused each time, but this saves the complication of a separate high tension distributor.

The pickups are encapsulated in a circular plastic molding which, together with the connectors that receive the leads from the coil module and microswitch, are fitted into the crankcase back cover. An outer plastic plate, attached with four screws, encloses the wiring and enables the assembly to be rotated to find the optimum full-throttle ignition timing.

INLET & EXHAUST SYSTEM. The inlet and exhaust pipes are fabricated from 12 mm o.d. steel tube, chromium plated. The exhaust ports are at the front of the cylinders in order to obtain maximum benefit from the cooling airstream and the exhaust pipes are carried to the rear of the engine where they discharge into a transverse muffler. The muffler is a plain non-baffled expansion chamber with two downward pointing 10 mm i.d. outlet pipes. Bolted to the muffler is a cast aluminum inlet manifold into which is inserted the carburetor and two inlet pipes. Heat transferred from the muffler to the inlet manifold is used to improve mixture atomization.

MOUNTING. Again following full-size aircraft engine practice, the FK-50 employs a separate vibration-damping resilient motor-mount assembly. The engine has three pickup points, one at the top and two at the bottom, to which stamped aluminum firewall brackets are bolted via a rubber bush and two rubber grommets.

PERFORMANCE. Having a separate lubrication system, instead of depending on oil mixed with the fuel, undoubtedly brings benefits. First, the engine runs very much more cleanly. Exhaust smoke is reduced and an insignificant amount of oil mist is discharged from the exhaust. Second, the engine is less prone to bottom-end corrosion, since it does not depend for lubrication on oil that has been contaminated in the combustion chamber. Third, since a petroleum-based oil is used, there is no risk of the bottom-end bearings being gummed up after prolonged storage.

There is, however, one thing to remember: a constant watch has to be kept on the oil level in the sump. The manufacturer's recommendation is that this should be checked every 15 minutes of operating time during the break-in. Our tests confirmed this and it would be a good idea, when the engine is first installed in a model, to check the oil level before every flight.

It is also advisable to change the oil quite frequently. As with all full-size engines, the first oil change should be made early—in this case after no more than 30 minutes' running time—as it will pick up quite a lot of microscopic particles of metal from the working parts when the engine is brand new. Any doubts about the value of an early oil change will be dispelled when the magnetic drain plug is removed: wiping a finger tip across the magnet will reveal a surprising amount of minute metallic particles and the oil will be much dirtier than subsequently drained off samples.

As the engine becomes broken-in and the scraper rings become more effective, oil consumption and contamination will diminish and both topping-up and oil changes will need to be done less frequently. The maker's recommendation is that the oil should then be changed every two to three hours' running time. It is a good idea to adopt the habit of draining the oil pan at the end of a day's flying while the engine is still warm.

The oil pan has a capacity of 30cc, or just over one fluid ounce, and a syringe is supplied with the engine to enable the correct amount of oil to be injected via the screw-in dipstick hole. This is helpful because, with fresh clean oil especially, it is not easy to see the oil level on the shiny aluminum dipstick.

Kavan is adamant that a synthetic oil must not be used. To do so will void the warranty. Conventional (petroleum) motor-oil of SAE 30 or SAE 20W-20 grade is specified.

Because the engine has spark ignition, some modelers will tend to associate this with the use of gasoline fuel (*a la* chainsaw two-strokes) but the manufacturer recommends the continued use of methanol. There are good reasons for this. Methanol is more expensive, both in terms of cost and consumption, but it runs cooler and is generally kinder to the engine, despite providing more power. It is also less of a fire hazard. The addition of a small proportion (2 percent) of castor-oil to the methanol is called for to ensure adequate upper cylinder and valve gear lubrication. The use of nitromethane is not essential but a small amount (2 percent again) will usually give a perceptable improvement in throttle response and a very slight increase in power.

The Kavan FK-50 comes very fully equipped but requires a 4.8 volt nickel-cadmium battery pack and a suitable switch for the ignition system. A 500-mAh pack should provide for about one hour's use but we opted for 1200-mAh batteries to reduce the need for frequent exchanging and recharging of packs during breaking-in and testing.

As previously noted, the ignition timing can be manually advanced or retarded by rotating the pick-up housing at the rear of the crankcase. This has two drilled lugs, through which a 3 mm diameter 4-inch long rod can be inserted to turn it. However, if the rod is inserted from above, its movement is severely restricted by the two upper engine mounting brackets, whereas inserting it from below is a little tricky when the engine is running, especially as one's hand is then close to the muffler outlet pipes.

Since it is essential, when performance testing, to have full and precise control over the ignition timing, we fabricated a permanent assembly with an easily accessible timing lever projecting from the side and a quadrant for holding the setting. This enabled the spark to be advanced at full throttle, according to load, in order to achieve optimum performance. Such a device is not so important for ordinary use. Here, one would simply fix the timing for the best full throttle performance on the chosen prop size. Timing is, of course, automatically retarded for starting when the microswitch, actuated by the throttle, brings the second Hall Effect switch into operation.

As befits an engine that is so different from most others, several days were spent in checking out the operation and performance of the FK-50.

A standard electric starter is not powerful enough for this engine but hand starting (hand protection or a large chicken-stick advisable) presented no problems. For starting from cold, we found the following procedure to be reliable. One, open needle-valve and throttle, choke intake and suck in for four full turns of the prop. Two, close throttle to idle setting, i.e. point at which microswitch operates. Three, switch on. Four, swing prop. The engine would then usually start within two or three revolutions.

When the engine is sufficiently broken-in for the needle-valve to be leaned out at full throttle, the spark can be gradually advanced (or retarded) until the optimum setting is reached. Never try to start the engine without closing the throttle to the idle setting, otherwise the advanced ignition setting will be left intact and you will receive a hefty backward kick from the prop.

After about a gallon of fuel had been put through the FK-50, some initial performance checks were made. Later, after a second gallon had been consumed, a recheck was made and slight increases in torque and power were recorded. As the performance curves show, torque reached 490 oz-in. at 6,700, while a maximum power output of almost 4.0 bhp was determined at approximately 8,850 rpm. These figures, representing a brake mean effective pressure of 124 lb/sq in. and a specific output of 1.27 bhp/cu in., are very good indeed. The FK-50, not unexpectedly, is the most powerful model aircraft engine tested in the twenty-five years that these reports have been appearing in *Model Airplane News*.

Available for use with the FK-50 is a Kavan glass-reinforced epoxy prop of 20x10 inch (nominal) diameter and pitch. It was turned, by our test engine, at 8,150 rpm static which, allowing for about 10 percent rpm build-up, means that, in level flight, it would be turning almost exactly on the peak of the power curve. Other typical prop rpm included 5,600 on a 22x10 Airflow beech prop, 6,500 rpm on a 20x12 Airflow beech, 6,700 on a 22x6 Airflow beech, 6,650 on a 22x10 Top Flite maple, 7,550 on a 20x8 Top Flite maple, 7,900 on an 18x12 Airflow beech and 8,300 on an 18x10 Zinger

maple.

Without readjustment to the carburetor, we found that the FK-50 would idle indefinitely when throttled down to about one-quarter of its full-throttle rpm on any prop. With minor adjustment, idling speeds as low as 1,200 rpm on the larger props were obtained without risk of one cylinder cutting out.

Once or twice, during the break-in, the engine started and continued to run on one cylinder only (a not uncommon occurence with twins). With a glow twin, it is feasible to attempt to light up the cold cylinder by re-energizing the glow-plug. With spark-ignition, it is necessary to stop and restart the engine. If it then fails to fire on the cold cylinder, it is probable that the plug has become too wet with fuel. It may have to be removed and the excess moisture blown from its interior.

As one would expect, the superior balance of its flat-twin configuration makes this engine infinitely smoother-running than single-cylinder engines of similar displacement and such vibrations as remain are effectively damped by the rubber bushed mounts.

Also worthy of note was the fact that, throughout our tests, the FK-50 showed absolutely no inclination to detonate, or to kick its prop loose, even when leaned out to the point where it would cut out through lack of fuel. This can be attributed to three things: (a) the reduced mean-to-maximum torque fluctuations of its alternate-firing twin cylinder layout; (b) its spark-ignition system which enables the spark timing to be precisely matched to speed and load; and (c) its compact bathtub combustion chamber with generous squish area to create squish turbulence.

There are, perhaps, just one or two refinements that would make the FK-50 even better from the operational point of view. A choke device fitted to the carburetor would be useful in cowled installations and a suitably located advance/retard lever would be an added convenience. Such minor criticisms in no way detract from the fact that the FK-50 Mk.II is a most impressive piece of machinery.

Peter Chinn, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■

TOP GUN

(Continued from page 29)

phenomenon that starred Eddie Murphy and has tallied more than $300 million in total box office grosses.

About the Production

In May of 1983, film producers Don Simpson and Jerry Bruckheimer discovered an article in "California" magazine that knocked their socks off.

Entitled "Top Guns," the story looked inside the world of jet fighter pilots attending the Navy's prestigious Fighter Weapons School, located at Miramar Naval Air Station north of San Diego, California.

"Not only did we like the title and strong aerial photography which accompanied the article," recalls Simpson, "but we were attracted to this uncommon environment, with its own terminology and its bigger-than-life characters."

Bruckheimer was impressed with the program where "the pilots that attend the actual Top Gun school are a combination of Olympic athletes in the sky and rock 'n roll heroes. We immediately saw a movie."

Simpson adds, "Both Jerry and I are of the opinion that movie audiences like to see a 'process' film. They like to enter new territories and learn how things work. 'Top Gun' introduces to them the unusual vocabulary of a fighter pilot, and the audiences will actually believe they are sitting in the cockpit of an F-14 pulling Gs."

Upon optioning the story for a motion picture, Simpson and Bruckheimer hired the writing team of Jim Cash and Jack Epps, Jr. to write the screenplay. But before the writing could begin, the producers flew to Washington, D.C. and presented their concept to the Pentagon brass.

"It was obvious that we would need the full and complete cooperation of the Navy in order to achieve the authenticity that was crucial to our story," explains Simpson. "Not only was the Navy 100% receptive to our plans for the film, but they suggested a technical advisor, a former Top Gun instructor named Pete Pettigrew who lived in Southern California and eventually became a key member of our production team."

With the Navy's blessing, writer Jack Epps, Jr. first traveled to NAS Miramar where he attended declassified Top Gun classes, flew an "alpha strike" in the backseat of an actual F-14 and researched the behavior of the outstanding young pilots who were there as students or instructors at the renowned Top Gun training school.

Acknowledging their desires for a strong visual style on "Top Gun," Simpson and Bruckheimer next hired British-born director Tony Scott to capture the sheer magic of the pilot's visionary world which encompasses land, sea and sky in a swirling fusion.

Working closely with Navy personnel at NAS Miramar, a group that included Admiral T.K. Cassidy, the producers continued to shape the script, and, in fact, sought the advice of the Admiral's staff in the creation of the key female character in the film. Although the early drafts of the screenplay identified the leading lady as a Navy Operations Officer, producer Simpson wondered if there didn't in actuality exist a civilian female who interfaced professionally and directly with the Top Gun students.

Admiral Cassidy introduced Simpson to a woman civilian employee of the Center for Naval Analyses (CNA) who is a specialist in Maritime Air Superiority. When the very attractive 6-foot-tall blond was summoned to the Admiral's

office to meet and talk with the producers, Simpson jokingly interjected about her own striking presence, "Do you have your SAG (Screen Actors Guild) card?" She was questioned at length about her work with the Navy, and the film's role of Charlotte Blackwood soon evolved as an astrophysicist who lectures Top Gun students on enemy fighter capabilities.

When it came to casting the film's male lead, Simpson insists that there was always just one choice for the role of Maverick, the strong-willed F-14 pilot:

"We had Tom Cruise in mind from the very beginning," declares Simpson. "We have liked him ever since we first saw him on screen in 'Taps,' and he was the first person considered for this film, so we didn't get involved with going after anyone else. We went out and got Tom Cruise."

For Cruise, the role of a skilled Navy pilot was a vivid contrast to his most recent film role where he portrayed a long-haired forest creature in Ridley Scott's "Legend." Once aboard the "Top Gun" cast and crew, Cruise dove headfirst into the world of "yanking and banking."

"I spent several months commuting between Los Angeles and the Miramar base, where I went to see some Top Gun classes and got to know as much as I could about the lives of the actual pilots," explains Cruise. "And what I discovered was a group of men who enjoy flying above almost anything else you can name."

Cruise's pre-production training for "Top Gun" was capped by a spectacular ride in the backseat of a TA-4, courtesy of the Navy's elite showmen, The Blue Angles.

Once Kelly McGillis was cast as the female lead Charlotte "Charlie" Blackwood, the actress also jumped into researching her role and began to study the complicated technical terminology with which her character had to be at ease. Kelly recalls, "Last year I was studying the Amish people for the movie 'Witness' and the next year, I'm learning about negative Gs and inverted flight tanks for 'Top Gun!' " The story and scope of "Top Gun" was nurtured and expanded.

With the start of principal photography fast approaching, director Tony Scott and his production team were busy confirming details with the Navy and laying out the shooting schedule which would take the company to NAS Miramar and such nearby naval facilities as NTC (Navy Training Center) and NAS North Island at Coronado. Flight suits and helmets were designed to maximize visual appeal and plans were finalized to customize the F-14s and F-5s which would become the undisputed stars of "Top Gun" 's dazzling aerial scenes.

Filming on "Top Gun" commenced on June 26, 1985, in Oceanside, California, and then moved for several weeks to Miramar where began the scenes which involve an impressive lineup of F-14 Tomcats, F-5 Tigers and A-4 Skyhawks. Temperatures on the flight line reached a sizzling 110 degrees Fahrenheit, and the thundering jet noise from nearby takeoffs and landings frequently halted filming, but few complaints were raised by the cast and crew, who found "Fightertown U.S.A." to be an awesome environment and experience.

Once filming began on the base, technical advisor Pete Pettigrew and Miramar's Public Affairs Officer Lt. John Semcken (a former Top Gun pilot)

Club of the Month

The Rocky Mountain Flying Machine is the "Club of the Month" for August 1986. Flying high is nothing new to this club, since they operate out of one of the highest spots around—Albuquerque, New Mexico. This is a good-natured bunch of modelers and president Joel C. DeBaca means to keep it that way. The club was recently awarded an AMA Charter and at the same time an award from the Salvation Army Air Force for having all that sky and still mastering the art of mid-air collisions, with only two airplanes in the sky in all of New Mexico at the time. Al Schmidlapp stated afterward that it wasn't his fault, that Darrell Eberting is just too good to be trusted.

Herb Peterson is the club's most prolific builder. He always has at least three projects going at once, which makes things a bit crowded in his workshop.

The club has a well-organized newsletter put out by Wayne Brummett and Robbie Lowe and it keeps the members up to date on what's going on. The name of it is *Flying High,* which the club hopes to be doing for a long time.

Model Airplane News is pleased to award two free one-year subscriptions to this club for their outstanding efforts, which are to be given by them to their deserving junior members.

Congratulations!

Each month M.A.N. will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). M.A.N. will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletters to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

played significant roles in advising the production on a wide range of items from dialogue to decor. Throughout the course of the production, Pettigrew made both technical and practical contributions to the script and also assisted in the choreography of elaborate air combat maneuvers. Semcken was not only called upon to advise actors about climbing into the F-14 cockpits or wearing their flight suits correctly, but served as an important liaison between the production company and the Navy when the cast and crew went to sea aboard an aircraft carrier.

By mid-July, the majority of the ground story had been completed, and the crew moved aboard the U.S.S. Ranger, which was dockside at NAS North Island. Although interior scenes only were filmed in the ship, it served as good preparation for Phase Two of the "Top Gun" production schedule—at sea aboard the U.S.S. Enterprise.

In early August, a limited number of cast and crew members (35 males) boarded an H-35 helicopter and were flown 110 miles off the coast of San Diego for four days of filming aboard the Enterprise. It was here that the Hollywood visitors had the opportunity to witness the severe conditions which provide a daily test for pilots stationed aboard a carrier.

It has been said that the best way to duplicate the experience of a night landing on an aircraft carrier is to place a postage stamp in the middle of your living room, turn out all the lights, then take a running jump and dive to the floor, hitting the postage stamp with your tongue. If you make it, you have just approximated a night carrier landing. If you miss, you'll have a new respect for the remarkable precision required to drop 50,000 pounds of screeching metal on a 700-foot strip of black and white parking lot.

To the cast and crew of "Top Gun," who had only been exposed to fighter pilots on *land,* a trip to sea aboard the U.S.S. Enterprise was an experience that none will ever forget.

Few were able to sleep amidst the deafening noise of planes and motors, and many of the cast and crew spent their time on the deck watching the amazing takeoffs and landings.

For both cast and crew, their "weekend at sea" was a memorable time, but after four days of cramped spaces and ear-shattering noise, they were happy to return to the peace and quiet on land.

Upon their return, Tom Cruise and Anthony Edwards spent two rigorous days filming an air-sea rescue. Clothed in helmets and full flight gear, they spent most of the two days in chilling ocean waters using their survival gear and staging a helicopter rescue.

While the majority of the cast and crew wrapped following the air-sea rescue, Phase Three—the aerial sequences and easily the most complicated portion of the entire filming—began immediately at Miramar.

Choreographed by a committee of experts including Tony Scott, aerial coordinator Dick Stevens and Top Gun Commander Bob Willard, these extremely intricate dogfighting maneuvers were flown by a selection of actual Top Gun instructors and outstanding pilots based at Miramar. Tony Scott, who filmed much of the action from a Lear jet which followed closely behind the twisting F-5s and F-14s, said that preparing for the aerial sequences was "like organizing a full-blown battle." Six other cameras that were mounted on an F-14 and operated by the pilot also captured a breathtaking sequence of maneuvers.

The "Top Gun" company next moved to Fallon, Nevada, to film ground-to-air sequences as well as additional air-to-air scenes. Approximately 20 pilots participated in these scenes, which were filmed with seven different camera mounts.

In another week, the crew traveled back to Miramar and it was at this juncture that five actors reported back to work for the ride of their lifetimes. Well-trained in water survival and aviation physiology following an intensive two-day course, actors Tom Cruise, Anthony Edwards, Rick Rossovich, Whip Hubley and Barry Tubb qualified for a long-awaited backseat ride in an F-14.

The pilots in charge who gave the actors an exhilirating experience in the skies have names like Tex, Flex, Jambo and Jaws. They hail from all parts of the country, range in age from mid-20s to early 30s and excel in a wide variety of sports that may include surfing, running and lifting weights just to start the day. Some are married with children, while others enjoy the single life...and all express a special reverence for rock and roll.

Today's jet fighter pilots are not unlike the gunslingers of the Wild West, except that these aerial cowboys roam the range keeping the peace, and most can fire a heat-seeking missile faster than an outlaw can get the gun from his holster.

The Top Gun program is for the training of the Navy's brightest pilots so that they become the best in the world. This commitment to excellence among Top Gun instructors is the same commitment that has been shared by the

NAME THE PLANE CONTEST

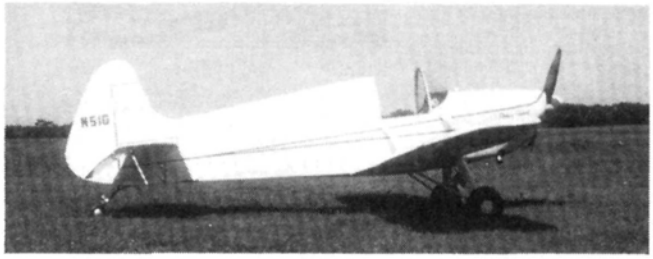
Can you identify this aircraft?

If so, send your answer to: Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail. If already a subscriber, the winner will receive a free one-year extension of his subscription.

The aircraft pictured in the June '86 "Name the Plane Contest" was the Pober Sport, built by Paul Poberezny and flown for the first time on July 7, 1959. The airplane was used as a promotional vehicle for the Experimental Aircraft Association and was flown on a tour of over 200 cities between 1959 and 1960 by EAA member and technical consultant Anders Ljunberg. Following the tour, the airplane was purchased by Kenneth Bride who in turn donated it to the EAA Museum, where it is now on permanent display at Wittman Airfield, Oshkosh, Wisconsin.

Congratulations to Ernest D. Harbin of Flushing, Michigan, for correctly identifying this airplane.



Other correct entries were received from Frank Beatty, Keith Alves, Al Johnson, Brian Smith, and many others.

instructors of the Navy Fighter Weapons School since its inception in 1968.

The establishment of such a school grew directly out of the United States' experience in Viet Nam. During the first years of the war, the kill ratio was three enemy planes (MiGs) shot down for every one American plane destroyed. During Korea, the average had been 17 to 1 and in World War II, 15 to 1.

This unsettling news led to the Navy's 1968 recommendation that a fighter pilot training program be created, and a year later, a small group of crack flight instructors from VF 121 got together in a small trailer at NAS Miramar (nicknamed Fightertown, U.S.A.) to plan such a program.

In time, the school would officially be termed the Navy Fighter Weapons School, but the first "call sign" attached to the project was "Top Gun," the name of an annual air-to-air gun competition held by various armed services in the 1940s and 1950s. The results of this innovative training program in air combat maneuvering (ACM) and "dogfighting" were dramatic, and when Top Gun graduates returned to the second half of the Viet Nam conflict, the Navy claimed a kill ratio of 12 MiGs for every Navy plane lost.

Today's Top Gun students are selected every 18 months by the squadron commander, who chooses one fighter crew (pilot and Radar Intercept Officer—RIO) that demonstrates extraordinary dedication and capabilities among their F-14 peers. (The Navy's F-14 pilots are those who have graduated at the top of their flight school classes, and it is said that when a pilot steps into the cockpit of the Tomcat for his first flight, the U.S. government has already invested one million dollars in his training.)

Embarking upon an intensive five week program of daily ACM flights and substantial classroom training, the students are instructed by an outstanding group of fighter pilots and RIOs, each judged among the Navy's best and all graduates of previous Top Gun classes. Maneuvers take place twice a day in several targeted areas, and performance is evaluated after each "hop" in a detailed debriefing.

At the conclusion of the class, these highly skilled pilots will return to their commands and share their Top Gun knowledge with the other 13 fighter crews in their respective squadrons.

The F-14 Tomcat, in which the Top Gun students train, is the U.S. Navy's supreme machine, as its pilots are its supreme flying force.

With "Top Gun," film audiences will be able to soar with them through grueling training and an aerial confrontation with an Eastern Bloc adversary. By experiencing the exhiliration of their flight, they will understand the superb skill that has brought them into a most elite fraternity comprised of the very best pilots in the world.

It is a world where there is no time for second guessing and no room for second best. This is the supreme flying force, and "Top Gun" is their story.

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